INTERGRATING COEXISTENT COMBAT AND CONVENTIONAL AIRSPACE WITHIN CONTINGENCY AREAS

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE
General Studies

by

JOHN B. ESCH, MAJ, USAF
B.S., University of Central Missouri, 1990

Fort Leavenworth, Kansas
2006

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
15 DEC 2006		

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Integrating coexistent combat and conventional airspace within contingency areas.	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
John Esch	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
US Army Command and General Staff College,100 Stimson Ave.,Fort Leavenworth,KS,66027	**ATZL-SWD-GD**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

During past contingency operations and against a backdrop of competing geopolitical and economic goals, the US military, its allies, and coalition partners found it necessary to integrate combat and conventional airspaces to support military objectives. The airspace management personnel who planned and executed these operations faced the challenge of combining two, distinct airspace control systems within a coexistent environment. The first system, combat airspace control provided under the theater air ground system, directly supported the joint task force commander's operations through safely and efficiently controlling airspace over the joint operations area. The second system, conventional air traffic services, handled civil and noncombat aircraft in host nation airspace, inclusive of, or adjacent to the joint operations area. The distinctions between these two systems are established in aircraft separation standards and techniques, and the significant fact that combat and conventional operations vie for use of the same airspace.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**1**	**99**	

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of Candidate: Major John B. Esch

Thesis Title: Integrating Coexistent Combat and Conventional Airspace within Contingency Areas

Approved by:

_____, Thesis Committee Chair
LTC John C. Reynolds, Jr., M.A.

_____, Member
Deborah C. Kidwell, Ph.D.

_____, Consulting Faculty
Col William A. Malec, M.A.

Accepted this 15th day of December 2006 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

INTERGRATING COEXISTENT COMBAT AND CONVENTIONAL AIRSPACE WITHIN CONTINGENCY AREAS, by Major John B. Esch, 99 pages

During past contingency operations and against a backdrop of competing geopolitical and economic goals, the US military, its allies, and coalition partners found it necessary to integrate combat and conventional airspaces to support military objectives. The airspace management personnel who planned and executed these operations faced the challenge of combining two, distinct airspace control systems within a coexistent environment. The first system, combat airspace control provided under the Theater Air Ground System, directly supported the joint task force commander's operations through safely and efficiently controlling airspace over the joint operations area. The second system, conventional air traffic services, handled civilian and non-combat profile aircraft in host nation airspace, inclusive of, or adjacent to the joint operations area. The distinctions between these two systems are established in aircraft separation standards and techniques, and the significant fact that combat and conventional operations vie for use of the same airspace.

ACKNOWLEDGMENTS

I would like to thank my thesis committee: LTC Chris Reynolds, Dr. Deb Kidwell, and Col Bill “WAM” Malec for their unyielding support, steadfast confidence, and resolute patience during this lengthy endeavor. Special thanks also go to LTC Blose, LTC Bahler, LTC Mahoney, and Mr. Burcalow for their exceptional instruction to this airman. To my classmates, from all services and the international arena, I thank you for teaching me the finer points of critical thinking and schooling me in the operational art. A special note of gratitude goes to Ms. Venita Krueger, for her timely intervention and expertise in supporting this project. Finally, to my wife, Sonia, and daughters Stacey, Jordan, and Taylor, you have my gratitude and love for sustaining me through this challenging, yet rewarding year.

TABLE OF CONTENTS

Page

ACRONYMS

ACA	Airspace Control Authority
ACP	Airspace Control Plan
ACO	Airspace Control Order
AFDD	Air Force Doctrine Document
AIC	Airspace Information Center
ALSA	Air Land Sea Application Center
AOC	Air Operations Center
CNS-ATM	Communications Navigation Surveillance-Air Traffic Management
DATCALS	Deployable Air Traffic Control and Landing Systems
DoD	Department of Defense
FAA	Federal Aviation Administration
FAAO	Federal Aviation Administration Order
FM	Field Manual
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
JFACC	Joint Force Air Component Commander
JOA	Joint Operations Area
JTF	Joint Task Force
MCWP	Marine Corps Warfighting Publication
MTTP	Multi Service Tactics, Techniques, and Procedures
NATO	North Atlantic Treaty Organization
TACS	Theater Air Control System
TAGS	Theater Air Ground System

TTP	Tactics, Techniques, and Procedures
US	United States
USAF	United States Air Force
VFR	Visual Flight Rules

ILLUSTRATIONS

Page

TABLES

Page

CHAPTER 1

INTRODUCTION

Flight into Dangerous Airspace

The pilot of the Boeing 747-400 with a capacity load of 400-passengers, checked his navigation computer, which visually depicted his intended flight route: over Pakistan, Afghanistan, a turn north clipping the Middle East, then Eastern Europe, and finally German airspace, landing at Frankfurt International. Favorable winds combined with an on-time departure puts the plane ahead of schedule. Approaching the Pakistan-Afghan border, Pakistani controllers in Lahore instruct the crew to contact Kabul Center in order to transient Afghan airspace. A veteran of this particular route, the pilot knows airspace over Afghanistan is both complicated and dangerous. Since the fall of the Taliban regime, the Afghan government has been working with the International Civil Aviation Organization (ICAO) and Coalition Forces to restore the Afghan air traffic structure. And while progress has been made, the pilot also knows that Kabul Center does not have radar, instead, relying on pilot position reports to keep aircraft separated. Scanning the horizon and looking at the setting sun, the pilot knows his large airplane, even with navigation lights on, is a small visual target in the big sky. Moreover, the pilot knows coalition aircraft may not show up on his Traffic Collision Avoidance System (TCAS) because of military necessity. Now over Afghanistan, the jetliner makes meticulous position reports with Kabul Center.

It is at that instance, the unthinkable happens--all over in a split-second. It started with a faint glitter on the horizon, a small reflection in the lower part of the aircraft's glare shield. A glimmering dot in the setting sun, it appeared directly below the cockpit and slightly left of course. Instinctively, the pilot pulled the control yoke back and banked the airplane to the right; increasing the distance between his aircraft and the unidentified target. He radioed Kabul Center to notify them he was maneuvering for traffic, but his call was drowned out by a rush of air and the sound of high thrust engines passing near the left side of the cockpit. Stillness then follows, replaced with the familiar sounds of the pilot's own craft slipping through air, as if nothing ever happened. Once level, the pilot puts the jetliner back on course. The crew was sure it was a military aircraft, but nationality and type could not be discerned at the high-closure rates. The pilot reflected on the moment, glances earthward, and wondered if the control agencies "down there" ever talk to each other or if they fully understood that, while the sky is big, airplanes sometimes have a nasty habit of finding each other at the same time and point in space.

The preceding vignette is not based on an actual incident; however, it is based on a composite of similar occurrences that were reported by commercial air carriers during

the author's tour supporting Operation Enduring Freedom in 2004. While this example is at the extreme end of incidents and is one which some may find melodramatic, it does in fact demonstrate the inherit weakness in airspace management and air traffic control systems in areas where combat and conventional airspaces coexists. Therefore, the thesis for this work is; given the complexity of global airspace, the United States (US) military, working in conjunction with its allies and collation partners, must improve their ability to control integrated, coexistent combat and conventional airspace during contingency operations in order to ensure flight safety and efficiency. In pursuit of that idea, this author will examine the relationship between these airspace environments; answering questions posed under combat and conventional airspace integration and fleshing-out recommendations to improve airspace control.

Problem Statement

The simultaneous control of combat and conventional airspace is a primary challenge for US air components engaged in military operations. Airspace control is, in essence, the "rules of the air" instituted for maximum application of combat operations, cognizant of the needs from a myriad of other airspace users, ranging from commercial airlines to state-operated (including military) aircraft. The breadth of these air operations vary greatly, and included fixed-wing, rotary-wing, unmanned aerial vehicles, and ground-based weapon systems. The overarching goal of airspace control is to prevent the collision between airborne assets while concurrently providing efficient use of Joint Force Command allocated airspace. Military and civilian airspace managers, including this author, have found this to be a daunting task over the past two decades, based on the complexity and capability of weapon systems, geopolitical factors of airspace

sovereignty, and economic aspects derived from airspace commercialization. This simultaneous use of combat and conventional airspace control will only continue to grow as military operations compete with commercial interests in a finite airspace environment.

Primary and Secondary Questions

The primary research question for this thesis is: Based on the need of a Joint Force Commander, via the airspace control authority (ACA), to integrate combat and conventional airspace against a backdrop of geopolitical and economic pressures, what is the most efficient means or protocols to regulate coexistent airspace? Underlining this question are secondary considerations that include determining the best agencies for building an integrated airspace control plan, identifying the facility or apparatus best suited for controlling coexistent airspace operations, and recognizing what set of international rules best serves to regulate coexistent airspace at contingency locations. For research purposes, contingency operations include humanitarian and combat actions that utilize air assets. Under this framework, this thesis will also address the complexity of simultaneously operated conventional and combat airspace environments in a rapidly expanding, seamless air traffic environment necessitated by globalization. In contrast to past contingency airspace control and flow operations, which are predicated on safety and efficiency, current and future contingencies will include airspace control as an integral part of the economic and geopolitical landscape.

Background

To fully understand the scope and focus of this research, it is vital for one to become familiar with, from a historical perspective, the background of airspace control. During World War II or Korea, there was only a rudimentary conventional air traffic control structure over Europe that was quickly supplanted by combat airspace control for defensive and offensive operations. In fact, from this author's interpretation it was not until the Vietnam Conflict did the aspect of joint conventional and combat airspace control become an issue. At that time, the US Air Force introduced the Air Traffic Regulation Center to segregate military aircraft from commercial carriers operating under standard International Civil Aviation Organization (ICAO) or host nation rules, while providing real-time control of combat aircraft. Air Traffic Regulation Centers were manned by both air traffic controllers and air battle managers, who worked air traffic separation based on specific flight profiles; for example, target ingress would be handled by air battle managers while air traffic controllers executed over flight and terminal operations.[1]

In the years between Vietnam and US operations in the Balkans, air service components did not rely, or require, a conventional-combat airspace mix. This includes operations in Panama, Middle East (Desert Storm), and Somalia, where conventional and combat airspace had a definite dividing line, the latter commonly referred to as "operational airspace" used for direct combat support. This changed with the onset of North Atlantic Treaty Organization (NATO) intervention into the Balkans where the surrounding airspace was bordered by robust air traffic control and airspace structure. Adding to the complexity, other Balkan operations, economic factors (the costs

associated with commercial operators circumnavigating combat airspace) and geopolitical concerns driven by airspace sovereignty, proved to be challenging obstacles.

Today, Afghan and Iraq air operations face the same challenges as in the Balkans, but on a much greater scale. Unlike the Adriatic region, where coalition forces could use well-established air traffic organizations and infrastructure to simultaneously work combat and conventional airspace operations, Afghan and Iraq airspace challenges airspace planners with reestablishing an entire airspace system. Additionally, there are political pressures from host nation entities to regain airspace sovereignty, and start collecting user and over flight fees as a source of revenue. In the case of Afghanistan, US Central Air Forces, under the auspices of US Central Command, instituted a joint effort with the Afghanistan Ministry of Civilian Aviation and Tourism to reestablish the Kabul Flight Information Region. The goal of this effort was to open Afghan airspace to commercial users by standardizing and normalizing air operations. Augmenting Afghan controllers with contract air traffic control specialist and equipment, the Kabul Air Control Center became operational in late 2005. The monetary incentive was certainly present, prior to closing Afghanistan's to accommodate Operation Enduring Freedom airspace activities; the Afghan government collected approximately $1.4 million a month in over flight fees.[2] In Iraq, similar efforts where undertaken by US Central Command, although the nature of on-going combat actions have limited complete integration of civilian air operations. In all, it has taken nearly four years, in each country, to reintroduce commercial air operations.

One of the potentially greatest driving factors in future airspace control, in both conventional and combat airspace arenas, is the introduction of Communications

Navigation Surveillance/Air Traffic Management (CNS-ATM). CNS-ATM represents air traffic control and airspace management approach to develop a seamless, global airspace environment. In essence, the world is growing-up, globalizing, and providing an environment where airspace is as much a commodity as any other natural resource. CNS-ATM has already affected how military and commercial aircraft are equipped (requires advanced avionics for navigation and traffic separation), and will certainly play heavily in contingency airspace operations. Based on the goals of CNS-ATM, and its subsequent geopolitical and economic pressures, the time and resources previously afforded to airspace mangers for "figuring out the airspace" during contingency operations may be insufficient, producing disjointed and unsafe airspace control.

Operational Concepts

Operational concepts are important part of this thesis, inasmuch they build a common characterization, as defined by the researcher, for terms used to support data analysis. Moreover, they provide the necessary background information on current combat and conventional airspace operations. This author will only introduce the most significant concepts and terms used; a more detailed glossary of terms will be included as an appendix (Appendix A). Readers should note that these concepts and their supporting definitions are a broad stroke; and are intended to be viewed from a strategic perspective.

The first concept that must be defined is that of airspace control as it is applied in this research. This is centered on "what" is airspace control, and "who" actually conducts it during contingency operations. Doctrinally, airspace control, "includes coordinating, integrating, and regulating airspace to increase operational effectiveness."[3] For research purposes, this is all airspace activity within or directly adjacent to the joint operations

area (JOA), inclusive of airspace management and its subordinate functions. These subordinate functions are air battle management and air traffic control. As for the who of airspace control, these are airspace managers, air battle managers, and air traffic controllers. These specialties, and their responsibilities, are discussed later. The who also includes command responsibilities as defined in Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone*. This doctrine specifies ACA is responsible for the following:

> Develop policies and procedures of airspace control and for the coordination required among units within the operational area.
>
> Establish an airspace control system that is responsive to the needs of the joint force commander, provide for integration of the airspace control system with that of the host nation, assist in establishing a civil structure where none exists, and coordinate and deconflict user requirements.
>
> Develop the airspace control plan and, after joint force commander approval, distribute it throughout the operational area. Implement the airspace control plan through the airspace control order.
>
> Provide necessary facilities and personnel for airspace control functions in assigned areas and identify these facilities and personnel for inclusion in the Airspace Control Plan.[4]

The ACA is a seminal concept throughout this work based on this position's responsibility and span of control. Although discussed here based on combat operations, the ACA is also responsible for conventional operations within the JOA, based on accountability for host nation integration and JOA-specific terminal operations. An important ACA distinction is this position handles airspace control across the strategic, operational, and tactical realms of airspace planning and execution.

Combat airspace control is a de facto type of air traffic control (when contrasted against conventional operations), based on procedural and positive control of aircraft.

During procedural separation, aircraft are provided a specific route of flight, altitude, and time; referred to as an airspace coordinating measure, and documented in the Airspace Control Order (ACO). The ACO provides aircraft an airspace reservation, to deconflict them from other airspace users, including aircraft and ground-borne weapons (artillery, missiles, and others). However, ACOs are only one-half of the combat airspace control equation. The other one-half is real-time control of sorties and other joint fires, usually accomplished through positive control provided by radar or other sensors, to handle mission changes incident to a fluid battlespace. This aspect is not routinely handled by air traffic controllers, but air battle managers (figure 1) assigned to specific airspace sectors. The bulk of combat airspace control is conducted under visual flight rules (VFR) conditions; however, airspace control measures or special instructions may permit instrument flight rules (IFR) operations under specific conditions on particular routes.

The Theater Air Ground System (TAGS) is the total planning and real-time control structure used to manage combat airspace in a designated theater. It connects the ACO with control agencies (air battle managers) and users, for execution of the air battle through the air tasking order. The TAGS service specific components are: United States Air Force (USAF) Theater Air Control System (TACS), Army Air Ground System, Navy Tactical Air Control System, and Marine Air Command and Control System.[5] Doctrinally, conventional air traffic control elements are incorporated into the TAGS through each service's airspace control function. However, from an operational perspective there are competing tactical goals; air battle managers are directing friendly aircraft to enemy air and ground targets, while air traffic controllers are separating

aircraft from each other and airspaces where ground engagements are taking place. Research will address this relationship in later chapters.

Figure 1. Air Battle Mangers at Work

Source: Jon Quinlan, "Tyndall Spearheads F-22 Fighter Tactics Integration," *Air Force Print News Today* [picture on-line]; available from http://www.af.mil/news/story.asp?stroyID=123024639; Internet; accessed on 25 November 2006.

Conventional Airspace Operations includes civil and military aircraft operating under Federal Aviation Administration and International Civil Aviation Organization air traffic control standards. It is inclusive of combat aircraft when operating in noncombat flight profiles when under the control of conventional air traffic services. Conventional procedures are conducted under IFR and VFR. IFR uses air-to-ground communications, coupled with radar or procedural separation, to ensure aircraft separation. Under IFR, aircraft are controlled in flight by reference to instruments due to meteorological conditions or operating environment; for example, heavily congested air traffic areas. IFR also supports efficient flight operations through metering air traffic flow through the

airspace. Pilots operating within IFR do not use visual procedures except during initial takeoff, the last stages of landing, and when visual weather conditions permit them the ability to “see and avoid” other aircraft, terrain, or obstacles. Conversely, VFR places air traffic separation (airplanes, restricted or special use airspace, obstacles, and terrain) on the pilot and or aircrew. As VFR implies, visual conditions must exist; for most operations this is 3 miles of visibility and 1,000 feet above or below clouds, permitting pilots the time to see and avoid. A notable distinction between IFR and VFR operations is the requirement for air-to-ground communication with control agencies; IFR always requires it, VFR does not. There are exceptions to this rule; however, they are not applicable to this thesis. Conventional airspace control is what the general populace is most familiar with, inasmuch it is the type of air traffic control routinely depicted in the media (figure 2).

Figure 2. Deployed Conventional Air Traffic Control Operations

Source: Staff Sgt Chad Chisholm, US Air Force Photo, *Air Force Link*, 2006 [picture on-line]; available from http://www.af.mil/photos/media_search.asp?q=controllers%20chisholm&page=5; Internet; accessed on 20 September 2006.

Assumptions

This study includes assumptions to support the methodology, analysis, and conclusions. The first assumption is that airspace managers find integrating combat and conventional airspace a challenge. This is an author-based input, based on experience as an airspace management branch chief for a USAF major command. In this capacity, this author spent over three years reviewing after-action studies, lessons learned records, and hazardous air traffic reports. These reports are restricted and therefore, will not be published or directly referenced in this thesis (see Delimitations). Second, research into airspace control assumes there is no single solution for every airspace environment. Each set of circumstances specific to a military operation provides a unique airspace environment, and therefore, an equally unique solution. Finally, research assumes airspace sovereignty in the 21st Century is taking on a new dynamic. That is, airspace is becoming a natural resource for the "owning" country, capable of geopolitical influence and producing economic capital.

Limitations

Limitations of this thesis are based on the lack of quantitative data and historical work aimed specifically at simultaneous control of coexistent conventional and combat airspace. However, there is adequate research into the control of contingency airspace, both under conventional and combat domains. Additionally, there are conventional and combat airspace managers and specialists (subject matter experts) available to provide qualitative data through practical application analysis. Using these two assets; doctrine and guidance on conventional and combat separated airspace and through interviews with

airspace experts, it may be possible to reach rudimentary solutions on coexistent airspace control.

Delimitations

Delimitations of the thesis are primarily imposed to keep the scope and focus of this thesis at an attainable level of fidelity and to ensure unrestricted access by future researchers. First among these delimitations is to confine research to the relationship between combat and conventional airspace, and not to delve into the specific operational details of each system. However, some background information will be introduced to give readers a base knowledge in which they can relate to the complexity of airspace control. Next, airspace will be categorized in a hierarchy, with combat airspace subordinate to conventional control. That is to say, as it is in the operational environment, overall conventional airspace always surrounds the boundaries of combat airspace. The exception is when combat airspace contains conventional terminal control, which is incidental to the combat airspace environment. The next delimitation is based on means used to report airspace deviations (near mid-collisions) and the fact they are proprietary, classified, or otherwise restricted. These reports will be used for broad background research, but not referenced. This is to ensure this thesis is available for the widest dissemination. Finally, research will only examine, in a peripheral manner, those tactical application areas where combat and conventional already integrate based on special qualifications. USAF Combat Controllers and tactically-qualified air traffic controllers are examples; capable of controlling aircraft under both combat and conventional air traffic standards.

Significance to Current and Future Operating Environments

The significance of this research is important in two areas. As previously stated, there is not a great deal of documented study concerning this subject and it is intended this thesis will stand as a possible starting point for future research. Next, the US armed services, and in particularly, the USAF, are currently evaluating airspace control in regard to post-Operation Enduring Freedom and Iraqi Freedom. The ACA-instituted combat and conventional airspace protocols for these operations proved complex, not based solely on military necessity, but also on geopolitical and economic demands.[6] This study is primarily aimed at supporting future combat and conventional airspace integration with planning and operational research in an effort to aid the next generation of airspace control professionals.

---

[1]Interview with Grover C. Brown, SMSgt (Retired), USAF, on 15 July 2006.

[2]Michael A. Grogan, *Airspace Control Authority in Stability Operations: The Role of the United States Air Force in Rebuilding Afghanistan's National Airspace System* (Maxwell AFB, AL: GPO, 2005), 12.

[3]Chairman, Joint Chiefs of Staff, Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone* (Washington, DC: GPO, 2004), vii.

[4]Ibid., figure II-1.

[5]Air Land Sea Application Center, Field Manual 3-100.2; Marine Corps Reference Publication 3-25D; Navy Tactics, Techniques, and Procedures 3-52.1(A); and Air Force Tactics, Techniques, and Procedures(1) 3-2.16, *Multiservice Procedures for Integrated Combat Airspace Command and Control* (Washington, DC: GPO, 2000), Glossary-13.

[6]Grogan, 11-15, 20.

CHAPTER 2

LITERATURE REVIEW

Introduction

This research includes an in-depth literature review as part of its analysis; consequently, that will appear in Chapter 4. Notwithstanding, some important background documents and works to support this study are introduced for familiarization. As acknowledged in the previous chapter, airspace management, and its subordinate functions of air traffic control and air battle management (to include joint terminal attack and forward air controllers), is a complex subject that requires a firm footing for potential researchers.

The goal of this literature review is twofold. First, since a publications evaluation plays a vital component of analysis, one must screen documentation to find the most suitable guidance. In reality, there is a vast quantity of published guidance on airspace control emanating from various sources, both national and international in scope. Second, it will familiarize one with some of the agencies and elements involved with airspace control, allowing one to understand the complexity and scope required for successful research. The layout of this chapter is based on a proposed outline of Chapter 4, "Analysis," and will start with military doctrine, then look at civilian guidance, and finish with other works published within the airspace management field. In regard to the latter, it is not anticipated that these works will be used for analysis, but for background; therefore, their review will be somewhat more reflective in character.

Military Doctrine and Guidance

Combat airspace operations are joint in nature--all branches of the US armed forces possess aircraft and other weapon systems that vie for airspace use. In the joint arena, Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone*, appears to be the primary doctrinal work. This publication states, "Integration of combat zone airspace control and civil air traffic control is vital to successful joint and multinational air operations."[1] This work is also inclusive of a complex relationship between differing airspace environments and addresses this subject though, "Civil ATC [air traffic control] integration may require detailed negotiations through the State Department, or national and local ATC agencies."[2] Of course, this is only a statement, putting that guidance into actionable work is the tough part and is a primary concern of this thesis. Nevertheless, the authors of this joint publication appear completely cognizant of combat and conventional airspace integration. Although short on details, it provides a solid foundation for further study.

Joint Publication 1-02, *DoD Dictionary of Military and Associated Terms*, and Joint Publication 3-30, *Command and Control for Joint Operations*, also provide background information on the common language and organizational layout of military command and control organizational structure.

The Air, Land, Sea Application Center (ALSA) publishes tactics, techniques, and procedures (TTPs) for combat airspace control through *Multi-service Procedures for Intergraded Combat Airspace Command and Control* (*ICAC2*). *ICAC2* is one of the best examples reviewed, inasmuch that it incorporates strategic, operational, and tactical employment for users. Additionally, *ICAC2* addresses the components of TAGS, and

how it is used to, "Integrated combat airspace command and control."[3] Moreover, this publication provides a "by service component" operational overview, detailing how each contributes to airspace control through combat and conventional airspace integration.

In addition to the *ICAC2*, ALSA also publishes the *Multi-service Procedures for Joint Air Traffic Control (JATC)*. Like its combat airspace counterpart, *ICAC2*, *JATC* is an overarching, definitive publication on the conventional elements of contingency-based air traffic control. What makes *JATC* so useful is its top down approach of air traffic employment from both service component and joint perspectives.[4] It is anticipate that much of the research for this thesis will find genesis and subsequently evolve from *JATC*.

Moving to the service components and starting with the USAF, this service uses Air Force Doctrine Document 2.1-7, *Airspace Control in the Combat Zone*. The USAF addresses several elements of airspace integration in this work, ranging from its interface in the TAGS to conventional air traffic integration. Of note, it doctrinally states, "US Air Force Deployable Air Traffic Control and Landing Systems (DATCALS) provide air traffic control in support of terminal flight operations;"[5] and "DATCALS also provide continuity of control with the (US Air Force) Theater Air Control System and air base defense."[6] The initial review in support of this project calls into question whether these statements are accurate, since provisional data indicates a divide between what is doctrinally stated and operationally employed. Research will study this potential discrepancy. In addition to doctrine, the USAF publishes a host of Air Force instructions on airspace and Air Operations Center (AOC) procedures, all of which will aid in research.

The US Army publishes Field Manual (FM) 1-120, *Army Air Traffic Services Contingency and Combat Zone Operations*, and FM 3-52, *Army Airspace Command and Control in a Combat Zone*. A preliminary review indicates these publications are similar in nature to their joint and sister-service equivalents and are extremely detailed in their description of the combat airspace environment. Moreover, FM 3-52 states the Army Airspace Information Center (AIC) as, "the primary ATS (air traffic services) facility that provides airspace information services and coordinates Army, joint, civil, and combined air traffic operating within the area of operations."[7] This is an interesting concept since the AIC from a strictly conventional air traffic control perspective, is not a traditional air traffic services facility. This may be an "Army only" distinction that requires additional study. In any event, the initial review of Army doctrine and guidance indicates enough information is available to support research.

Navy and Marine Corps publications have, to date, been tougher to locate. This author does not believe this will hinder research because these services' contribution to the TAGS is included in joint and multiservice guidance. This should not be interpreted as a disqualifier for accessing Navy and Marine Corps operations. It just means the researcher will need to find different avenues to evaluate Navy and Marine Corps airspace activities. However, it is anticipated tactical-level publications, such as Marine Corps Warfighting Publication (MCWP) 3-25.7, *Tactical Air Operations Center Handbook*, will provide a nominal amount of information to research goals.

Civilian Publications

Civilian airspace guidance is drawn from US federal oversight, performed by the Federal Aviation Administration (FAA), and international standards and practices. US

guidance is noted as a source, due to the fact US military aircrews and controllers commonly use "American" procedures when deployed outside the US.[8] An example of this will be provided later in this chapter. Additionally, civilian guidance is impacted by a multitude of regional or host nation rules making this aspect of research that much more complicated. Due to this fact, the scope of civilian publications reviews to US, international, and if required, select regional sources will be limited.

In the US, Federal Air Regulations (FARs) and Federal Aviation Administration Orders (FAAO) provide airspace guidance. The primary US publication for civil-military interface is FAAO 7610.4, *Special Military Operations*, and it offers a multitude of information on civil-military cooperation and airspace integration. Additionally, this publication includes eighteen appendixes dating back to 1964, providing not only operational information, but also the additional advantage of historical perspective. The author expects this document will directly support research while providing a catalyst for exploring new ideas.

The United Nation's ICAO is the parent organization for global air operations. Headquartered in Montreal, Canada the goal of this agency is to promote international air safety through standardized standards and procedures. To do this, ICAO obtains agreements between "Contracting States" who are signatories to the various conventions and annexes. The primary published literature in this area is Annex 11, *Air Traffic Services*, and Document 9554, *Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations*. Obtaining these documents is a research challenge; they are expensive and their use may be proprietary in nature. To overcome this subordinate limitation the researcher will use a subject matter expert that is

extremely versed with ICAO procedures to collaborate or refute research findings. Notwithstanding, there are ICAO documents freely available to the public and research will take advantage of these when warranted.

In addition to ICAO, the researcher anticipates the need to review documentation produced by regional agencies or organizations. Selecting a suitable region(s) is a factor that will be research driven, based on past interaction between combat and conventional operations for a specific, geographical location. Tentatively EUROCONTRL, the air traffic service provider for most of Europe, is the most promising candidate. This is based on US participation in NATO and the alliance's action in recent combat operations in the Adriatic region. EUROCONTROL publishes various works on military-civilian cooperation; a good example is their 2001 report on the *Status of Civil-Military Co-ordiantion (sic) in Air Traffic Management.* This study will review other EUROCONTROL material, and that from other regions, as research dictates.

Other Works

In addition to military doctrine and civilian guidance, research can turn to other published works for background information. These works are useful in that they document how airspace control was implemented in previous contingencies. Although this researcher, based on training and experience, is familiar with the intricacies of airspace management, it is important to review the work of other authors in order to gain a contrasting perspective. While research uncovered several articles related to this study, three works were selected that provide broad or unique views of airspace control.

In his work titled, *The Miracle of Operation Iraqi Freedom Airspace Management*, Alexander M. Wathen states:

> During OIF, Australian controllers in the tower at Baghdad International Airport provided air traffic control at the airport while US Air Force controllers in the mobile radar units (TPN-19s) provided approach control services. The Australian controllers used ICAO procedures and the US Air Force controllers used FAA procedures. This arrangement worked poorly at first, but over time, human perseverance overcame the lack of proper training and now they are working together efficiently.[9]

This example points out one of the deficiencies in combat airspace management. While this is not an integration problem between differing airspace environments, it is a problem between differing agencies. This appears to be a common theme in airspace control and is subsequently identified as one of the research points for this thesis. Mr. Wathen goes on to identify and discuss some of the other issues pertaining to Operation Iraqi Freedom airspace management. This article was found to be one of the best articles available, laden with useful background information for this study.

In Bruce D. Callander's article "Controllers," he investigates the relationships between combat controllers and enlisted tactical air controllers. This is a superb article that draws the distinctions of combat and conventional airspace control, as executed on the extreme end of tactical environment. It is here where one is introduced to combat controllers, who provide conventional control into airfields, and enlisted tactical air controllers, who control airspace for close air support. The relevance to research is extrapolating this relationship beyond the tactical level, to the operational or strategic level where the same concerns are present but from a policy-making perspective.

The final piece examined under this section is the *JTF Katrina Airspace Control Plan*, authored by 1st Air Force to support the Hurricane Katrina national response. This plan integrates conventional and combat airspace in a coexistent environment; consequently, it is an operational-level publication that directly supports research. While

there are certainly other airspace control plans that meet this level of research fidelity, this one was selected because it is inclusive of a long-standing support arrangement between combat and conventional airspace agencies: the FAA and the Northern Command air component (and its predecessor). The initial research review substantiated this relationship, and it is apparent the authors were well aware of the complexity and operational requirements of each airspace type. Although preliminary at this point in research, it is anticipated this work will play a major role in the analysis portion of this study.

Summary

This author found that acquiring suitable literature for this study was easy; it was in selecting the appropriate publications that proved somewhat challenging. Since the publication review is a mainstay in both the methodology and analysis of this study, careful deference was afforded to a wide range of sources. From a research perspective, one of the biggest pitfalls facing this study is "cherry-picking" information, finding only that data that supports this researcher's thesis. In regard to that possibility, the use of subject matter experts and a research committee was introduced as a balance to researcher induced bias.

---

[1]Chairman, Joint Chiefs of Staff, Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone* (Washington, DC: GPO, 2004), III-2.

[2]Ibid.

[3]Air Land Sea Application Center, Field Manual 3-100.2; Marine Corps Reference Publication 3-25D; Navy Tactics, Techniques, and Procedures 3-52.1(A); and Air Force Tactics, Techniques, and Procedures(1) 3-2.16, *Multiservice Procedures for Integrated Combat Airspace Command and Control* (Washington, DC: GPO, 2000), I-1.

[4]Air Land Sea Application Center, Field Manual 3-52.3; Marine Corps Reference Publication 3-25A; Navy Tactics, Techniques, and Procedures 3-56.3; and Air Force Tactics, Techniques, and Procedures(1) 3-2.23, *Multiservice Procedures for Joint Air Traffic Control* (Marine Corps: PCN 1440000380, 2003), viii-x.

[5]Department of the Air Force, Air Force Instruction 13-1, *Operational Procedures, Air and Space Operations Center* vol. 3 (Washington, DC: GPO, 2005), 29.

[6]Ibid.

[7]Department of the Army, Field Manual 3-52, *Army Airspace Command and Control in a Combat Zone* (Washington, DC: GPO, 2002), C-13.

[8]Alexander M. Wathen, "The Miracle of Operation Iraqi Freedom Airspace Management," *Air and Space Power Journal*, 4 October 2005 [chronicle on-line]; available from http://www.airpower.maxwell.af.mil/airchronicles/cc/wathen.html; Internet; last accessed 25 November 2006.

[9]Ibid.

CHAPTER 3

METHODOLOGY

Introduction

The methodology used to find recommendations to the primary and secondary questions relies on data collected from two main sources. The first source lies in current doctrine, published guidance, US Federal Air Regulations and their international equivalent, and technical works. As previously stated, there is an overabundance of documented procedures directing the integration of conventional and combat airspace; therefore, it is anticipated the analysis will focus more on how airspace managers, air battle managers, and air traffic controllers implement the rules that govern each type of airspace environment. The second source is based on non-directed interviews with subject matter experts and based on their experiences in contingency environments. In this capacity, these interviewees form a specialty committee, able to collaborate, accept, or reject the validity of background data used in this work. This author will then apply data from subject matter experts' inputs to case studies, to validate or refute findings.

Standards

Establishing suitable operational design criteria for this thesis is based on three areas: the relevance and acceptability of published standards and practices, the qualification and experience of experts, and the feasibility and operability of potential solutions. Combining these three, distinct areas are required to preclude findings based on a single approach gleaned strictly from literature review, ultimately leading to a "status quo" solution. While status quo may, in fact, be one of the recommendations of this

thesis, it alone does not provide the required academic rigor to either support or oppose answers to the primary and secondary questions. Furthermore, the operational design of this work is aimed at finding a broad solution for conventional and combat airspace integration, and not a specific resolution for a particular area or operation. Consequently, various sources in the form operational experienced acquired from experts, and combined with acceptable procedures for airspace control, will provide suitable information. To amplify, "acceptable procedures," as defined for this work are the international practices and rules used to effectively manage airspace and control air traffic. These are based on safety, efficiency, and overall acceptance by airspace users.

Beginning with standards and practices, it is important to note that finding relevance and acceptability are not automatically assumed due to nation-state, military, or international recognition of published guidance. Air traffic and airspace control may vary greatly between nations and within the elements of those nations; for example, civilian versus military standards. Although many countries are signatories to the United Nation's ICAO conventions, their internal procedures may amend or deduct from these practices. What may be acceptable to one nation or civilian entity may be unacceptable to another. The goal when evaluating standards and practices are somewhat problematic since it is based on what is published vice what may be universally accepted. Subsequently, it requires due diligence by this author to use nineteen years of formal training and operational experience to render an objective evaluation.

The use of subject matter experts is paramount to a successful outcome of this work. These professional airspace managers and users are required to provide the necessary background information to establish a workable starting point for identifying

possible recommendations. However; there are two important factors that must be considered concerning interviewees: their qualifications as to attainment of “expert” status, and professional and legal protection of their participation in this study. As for the former, this author used the following standards to identify an “expert” airspace manager or user:

1. National certification as a civilian or military air traffic controller or service-specific qualification as an air battle manager, with at least twenty years combined experience in air traffic control and or air battle management.

2. Formal training and practical experience as a combat and or conventional airspace manger.

3. Aircrew personnel require at least 1,000 hours of total flight time, inside and outside the US and designation an instructor pilot, navigator, or flight engineer.

4. Participation in combat or contingency operations in a managerial or operational capacity. The window for this participation extends from what is widely accepted as modern air traffic operations: circa 1960 until the present date.

Protecting the professional credibility and legal liability of participating experts is also a primary concern of this research. Professionally, it is important to understand these participants have reputations that directly affect their ability to successfully function within their current positions. Specifically attributing their inputs would limit their academic freedom and adversely preclude their full and unrestricted contribution. Legally, it is important to note that each participant is licensed, to some degree, by the government agencies that provided their respective certifications. By “going on the record,” these participants open themselves to future scrutiny and possible legal liability,

especially if they are involved in a future air traffic or aircraft mishap investigation. To that end, subject matter experts will not be identified by name, location, or date in reference to specific data or comments; however, they will be listed in the bibliography as a contributor. Interviewees agreed to this arrangement and released any data garnered through research for publication.

The final standards element is comprised of the feasibility and operability of data as applied to a practical environment. Under this work, feasibility is defined as the ability to successfully integrate airspace during a contingency operation. Operability, like feasibility, is also based on the ability to control the current airspace environment. Operability relies on existing airspace management technology; however, greater latitude is given when evaluating operability to specific recommendations. This is required as operability is the physical capability directly supporting feasibility and therefore, may include less defined or developed ideas to successfully explore new solutions.

Conclusion

There is little doubt that finding narrow, operations-based recommendations to the primary and secondary questions is a daunting undertaking. In practice, there are perhaps several solutions to successfully integrating combat and conventional airspace; yet these may or may not meet the peripheral elements impacting the rapidly expanding, global airspace environment. Based on the author's past experience, the USAF, in conjunction with other services, is actively pursuing advanced airspace management systems and procedures. Notwithstanding these efforts, which are based on intermediate timelines (three to seven years), the reality is these solutions focus primarily on combat, not conventional, airspace control. A well-defined operational design based objective

evaluation current guidance, coupled with examining past experienced and married with existing technology, will lead to some level of situational fidelity inside a complex airspace.

CHAPTER 4

ANALYSIS

Introduction

This research is conducted to identify and recommend the most efficient means or protocols to integrate coexistent combat and conventional airspace in contingency areas. To that end, means and protocols are inclusive of the most practicable methods for determining the best agency to develop an integrated airspace control plan, identifying the facility or apparatus best suited for controlling coexistent airspace operations, and recognizing what set of international rules best serves to regulate coexistent airspace. For this analysis, this researcher reviewed published guidance and evaluated practical application using interviews and case studies. These two approaches promised the best opportunity to gather data on contingency airspace operations in the strategic, operational, and tactical realms of employment.

In reference to publications, finding a starting point is difficult since there is such a large array of published guidance, at policy-making and subordinate levels, for establishing a civil-military joint airspace relationship during contingencies. This is supported by the fact that military and civilian agencies have well-documented procedures for administering airspace in their respective domains, both under combat or conventional conditions. In addition to published guidance review, an effective analysis of airspace control must also include a look at practical application. To meet this requirement the researcher conducted interviews with subject matter experts and evaluated past operations (case studies) to collaborate findings. This aided in identifying

the fidelity between what is written and what is actually implemented, and to what degree these two elements synchronize or diverge.

Part I--Published Guidance

Combat Airspace Operations

The primary source for US overarching combat airspace operational guidance is Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone*. This doctrine is specific about the requirement of integrating combat and conventional operations.

> Integration of combat zone airspace control and civil air traffic control (ATC) is vital to successful joint/multinational air operations. The airspace control plan should provide procedures to fully integrate the resources of the military and civil ATC facilities responsible for terminal-area airspace control or en route air traffic control when required**.** Civil ATC integration may require detailed negotiations through the State Department, or national and local ATC agencies. All ATC elements or their liaisons must be involved from the outset in planning and executing airspace management. They ensure airspace requirements are coordinated with and approved by the appropriate agencies. Elements may participate in the development and integration of a host nation airspace infrastructure. ATC personnel may also provide planning, terminal, airspace information, and forward-area support services to aviation assets conducting nation assistance.[1]

This paragraph is a change from the previous Joint Publication 3-52,[2] so it is evident that US military understands some level of cooperation must exist between combat and conventional airspace and has learned this from past experience.[3] Moreover, this doctrine defines the initial relationship between civil-military agencies in the contingency environment.

Besides joint doctrine, the Air Land Sea Application Center (ALSA) publishes multiservice TTPs for combat airspace control. This study looked at two of these TTPs, the first being *ICAC2*, which delineates guidance for incorporation of each service's

airspace control elements. *ICAC2* provides some relevant inputs into the conventional-combat airspace merge, beginning with its object to "Integrate US airspace C2 [command and control] and air defense control structures with HN [host nation] airspace and air defense control structures."[4] Moreover, *ICAC2* delineates who, inside the TAGS is the responsible point-of-contact; "Airspace control sectors are designated by the ACA in consideration of joint force component, host-nation, and multinational airspace control capabilities and requirements."[5] Although sparse in "how" details regarding combat and conventional airspace integration, this publication provided the best, overall vision of the contingency airspace environment. Despite any shortcomings that may be present in *ICAC2*, the next TTP, *JATC*, certainly makes amends in effort to address the challenges inherent in a coexistent airspace environment. It specifically details the overall relationship between the conventional air traffic and combat airspace command and control functions. Moreover, it identifies the relationships between civilian and military air traffic agencies and is one of the few publications reviewed that provide a roadmap to airspace integration, albeit mostly at the tactical level.[6] Research indicated this TTP is the most useful airspace control and integration publication available.

Subordinate services also have their own doctrine when it comes to combat airspace. The USAF has historically provided the Joint Force Air Component Commander (JFACC) and an associated AOC during Joint Forces Operations. (This does not preclude the Army, Navy, or Marines from acting as the JFACC or ACA.) The USAF draws from Air Force Doctrine Document (AFDD) 2.1-7, *Airspace Control in the Combat Zone*. This document addresses several elements of airspace integration, which include:

> Close coordination between airspace control, air defense, and air traffic control (tactical aspect of air traffic control) elements is required to maximize combat effectiveness while preventing fratricide and mutual interference. Terminal area air traffic services and airfield management must be capable of supporting operations as required by the Joint Forces Commander.[7]
>
> US Air Force Deployable Air Traffic Control and Landing Systems (DATCALS) provide air traffic control in support of terminal flight operations. DATCALS are designed to ensure safe, flexible, and efficient use of terminal airspace. DATCALS also provide continuity of control with the (USAF) Theater Air Control System and air base defense. Air traffic control and airfield management personnel will deploy, operate and sustain DATCALS to support operations at bare-operations until the theater is capable of supporting operations and the resupply pipeline is established.[8]
>
> Air traffic controllers and air defense controllers may be assigned to the air component as combat airspace managers to support the COMAFFOR/JFACC. Their duties include assisting in ACP/ACO development and production, as well as planning for the full range of airfield operations to support deliberate and crisis-action planning, deployment, employment, sustainment, and redeployment of airfield operations forces.[9]

Additionally, AFDD 2.1-7 goes on to state, "Airfield operations (under USAF doctrine, airfield operations is a blanket term that includes airfield management, air traffic control, airspace management, and terminal instrument procedures functions) personnel provide liaison support to the various worldwide cells or theater staffs to ensure the US and its allies can quickly apply global power to crisis situations anywhere in the world by delivering combat air and ground forces."[10] Obviously, as a subordinate organization the Air Force drills-down deeper into the operational realm of airspace management in order to prepare its forces for airspace control in contingency areas. Like its joint counterpart this document provides the "who, what, where, and when" of airspace management.

The Air Force organizational structure also address airspace management, as represented in the AOC, in Air Force Instruction 13-1, Volume 3, *Operational Procedures: Air and Space Operations Center*. This instruction lays out the

responsibilities of airspace management inside the AOC requiring personnel, “Coordinate with host nation on airspace control issues, requests, and problems.”[11] This is an extremely broad statement that is not further delineated in this particular document, yet is serves to at least establish an airspace-issues foothold within the AOC. This is not anomaly, since the USAF primarily uses TTPs to discuss the “how” of a particular function. (See ALSA multi-service TTP *JATC*)

In addition to the USAF, the US Army has developed service-specific doctrine. The Army uses FM 1-120, *Army Air Traffic Services Contingency and Combat Zone Operations*, and FM 3-52, *Army Airspace Command and Control in a Combat Zone*. These publications emulate the content of their Joint Publication counterpart but the later, FM 3-52, is more inclusive of the civil-military airspace relationship. In that regard, this guidance requires Army Airspace Command and Control elements to interface “with the Airborne Warning and Control System (AWACS), the International Civil Aviation Organization, and the Federal Aviation Administration Air Traffic Control System for real-time airspace management.”[12] Additionally, it defines the Army AIC as, “the primary ATS [air traffic services] facility that provides airspace information services and coordinates Army, joint, civil, and combined air traffic operating within the area of operations. All AICs in theater form a system that interfaces with the joint, combined, and host-nation airspace management systems. The AIC primary function is to deconflict, separate, and monitor airspace users.”[13] In contrast the USAF, whose tactical framework for dealing with airspace management is a product of TTPs, the Army combines it tactical and operational realms together in published guidance. This does not exclude the Army from publishing TTPs; however, the Army understands airspace users come from

different backgrounds; therefore, it provides more background information for its personnel.

The Navy also publishes guidance for airspace management, but for the purposes of this thesis, research will preclude strictly maritime operations. This omission is based on the oceanic airspace environment which is markedly different than the airspace over land and littoral areas. Oceanic air traffic control includes a vast array of specific "over water" agencies, procedures, and guidance that exceeds the joint nature of this thesis. Notwithstanding, the Navy, when supporting joint theater operations either afloat or during amphibious operations can integrate with the TAGS through the Navy TACS.[14] Based on this fact, naval operations that are either direct or peripheral to integrated airspace operations will be included in findings and recommendations, as required.

The US Marine Corps provides airspace control for amphibious or land-based operations, as outlined in MCWP 3-25.7, *Tactical Air Operations Center Handbook*. This guidance states, "The tactical air operations center (TAOC) is the Marine air command and control system's (MACCS's) principal air defense agency that conducts airspace control and management."[15] Additionally, it states the Tactical Air Operations Center under military and non-military conditions, presents "deconfliction procedures with civil airways/Federal Aviation Administration (FAA)."[16] Like the Army, this publication combines various elements of the tactical and operational areas. This publication also mirrors many of the elements listed in *ICAC2*, both positive and negative in scope.

Summarizing US combat airspace control publications, it is apparent guidance gives deference to conventional airspace during contingency operations. At the joint and service-specific levels the US military has included guidance on planning and executing

air operations cognizant of overlying or adjacent conventional airspace, and understands the need to coordinate operations between these differing systems. Although spread out over several different publications current military doctrine and guidance, in its totality, supports research in answering the primary and secondary questions, albeit, from a strictly military perspective.

Conventional Airspace Operations

Conventional airspace, as previously defined in this thesis, includes civil and noncombat air operations conducted under peacetime standards and practices. Under this domain, there are two main sources supporting this research, US and international. Federal Air Regulations (FARs) and Federal Aviation Administration Orders (FAAO) are administered by the US Department of Transportation's FAA and focus on air operations within the US. Subsequently, these are standards and practices in which US pilots and controllers are trained. While not fully implemented in overseas contingencies, organizational inertia tends to make these standards and practices the de facto rules used during US overseas operations.[17] Additionally, FARs and FAAOs are the rules for contingencies in US airspace, for instance, during humanitarian relief operations like those in the wake of Hurricane Katrina. As previously mentioned in Chapter 4, the US military and its civilian counterparts have a standing airspace management system for dealing with such events. A review of existing FARs and FAAOs validates the requirement for cooperation on airspace matters in several publications, but it is FAAO 7610.4, *Special Military Operations*, that is the base guidance outlining the civil-military links in US airspace. This FAAO, built over decades of interagency teamwork, details US civil-military strategic and operational frameworks and agreements. Moreover, it works

in unity with other civil and military directives to ensure a seamless airspace environment. Research found this publication to be a stalwart example worthy of emulation within the airspace management community.

International airspace practices and standards provide an even more challenging task with regard to conventional and combat airspace management. This includes rather lengthy forays into the world of international civil aviation law. This is highlight by the fact that host countries may amend, disregard, or preclude utilizing the rules instituted under international agreements. An example is US use of ICAO Class F airspace, an airspace classification which denotes limited air traffic services. Although the US is a signatory to ICAO conventions, it does not implement Class F airspace within US airspace.

ICAO is the United Nations agency charged with global air operations interoperability and safety. Founded in 1944, ICAO is formed with 192 (currently) "Contracting States" that are party to international agreements that are published in Annexes to the convention. ICAO standards and other provisions are developed in the following forms: (1) Standards and Recommended Practices--collectively referred to as SARP; (2) Procedures for Air Navigation Services--called PANS; (3) Regional Supplementary Procedures--referred to as SUPPs; and (4) Guidance Material in several formats.[18]

> A Standard is defined as any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38 of the Convention.[19]

> A Recommended Practice is any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavor to conform in accordance with the Convention. States are invited to inform the Council of non-compliance.[20]
>
> SARPs are formulated in broad terms and restricted to essential requirements. For complex systems such as communications equipment, SARPs material is constructed in two sections: core SARPs - material of a fundamental regulatory nature contained within the main body of the Annexes, and detailed technical specifications placed either in Appendices to Annexes or in manuals.[21]
>
> The differences to SARPS notified by States are published in Supplements to Annexes.[22]
>
> Regional Supplementary Procedures (or SUPPs) have application in the respective ICAO regions. Although the material in Regional Supplementary Procedures is similar to that in the Procedures for Air Navigation Services, SUPPs do not have the worldwide applicability of PANS.[23]

This protracted introduction to ICAO standards is important so readers can understand the complexity of establishing ICAO guidance. Research revealed this process is lengthy and wrought with bureaucracy supporting the notion airspace management is a complex undertaking, and the civil publications to support it are consequently as intricate.

ICAO procedures also address contingency operations from a global standpoint. From a strategic perspective, these include Annex 11, *Air Traffic Services*, Document 9433, *Manual Concerning Military Interception of Civil Aircraft*, Document 9554, *Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations*, in conjunction with decisions made at international conferences and seminars. However, for the purposes of this research and based on interviewee feedback from subject matter experts, the overarching nature of these publications does not provide the level of detail needed to support or deny evidence for the primary and secondary questions. Nevertheless, these publications do, along with

other ICAO guidance, lead to the more appropriate area of study; the use of regional supplements to administer airspace during contingencies.

Using ICAO guidance as a framework, regional guidance focuses on specific geographical areas (Pacific, Europe, and others) and amplifies international regulations into executable rules and agreements. For instance, EUROCONTROL, the air traffic service consortium that controls most European airspace publishes detailed civil-military interface guidelines, with a key element being the "Harmonization of Military OAT (Operational Air Traffic) and its Civil GAT (General Air Traffic) Interface."[24] This initiative stresses not only civil-military integration, but lays out the processes for attaining cooperation and safety. Additionally, EUROCONTROL breaks down the strategic, operational, and tactical relationships between civil and military operations as follows.

1. Strategic-Level: Definition and review of national airspace policy and organization.

2. Pre-Tactical (Operational) Level: Daily allocation of the required airspace.

3. Tactical Level: Resolution of specific airspace problems and/or individual OAT/GAT traffic situations.[25]

This EUROCONTROL approach to civil-military coordination is more than just written procedure, but is also integrated into their organizational structure. EUROCONTROL utilizes a Civil-Military Interface Standing Committee, Military Harmonization Group, and a Military Team to coordinate airspace structure advances under ATM/CNS.[26] This relationship shows a remarkable parallel to the US's FAA-

Department of Defense (DoD) structure and hence, garners the same effective integration successes.

However, while the US and European models prove that airspace integration is possible with an appropriate level of interagency cooperation, these examples also point out the potential for operational deficiency in areas where the airspace infrastructure and host nation resources are lacking. The corollary question is; how does a contingency ACA duplicate the successful civil-military cooperation where standing procedures, operations, and organizations have not previously been established? This research can answer that question, but not through reviewing documentation alone. It requires a combination of document review and past practical application, the latter addressed in the next section of this work.

Reviewing conventional airspace operations, there is a multitude of international, regional, and state-sponsored guidance intended to support integrated civil-military operations. These publications establish the need for absolute collaboration between civilian airspace control agencies and their military counterparts with an emphasis on safety and efficiency. Moreover, it appears they provide the framework that is cognizant of the political and economic postures that impact the overall airspace architecture.

Summary

For this researcher, finding the appropriate literature for this study proved somewhat challenging based on the wide array of agencies, host nations, and international entities that publish such guidance. This forced this author to select publications that indicated an overall operational theme during contingencies. Additionally, discovering relevant documentation as it relates to integrated conventional

and combat airspace proved even harder, not because of lack of documentation addressing each airspace environment individually, but the nature of agencies to publish generalized works. That aside, the literature review did provide insight into evolving airspace doctrine and guidance, driven by ever-increasing incidents of simultaneous operated conventional and combat airspace control.

Part II--Practical Application

The ability for airspace managers to practically apply guidance in the operational environment is a litmus test for integrated combat and conventional operations. This is true in both the static (US, Europe) and contingency environments. To address this aspect of research, select interviews were conducted with subject matter experts to provide background information. Additionally, case studies were conducted on contingency-derived events where coexistent airspace operations were implemented.

Interviews

This author conducted background interviews with subject matter experts in a non-directed, qualitative manner. Specifically, interviewees were asked to present their perspective on past integrated combat and conventional airspace operations based on their experience and training. This approach proved especially effective in a sense that the criteria to qualify as an expert, per the methodology discussed in Chapter 3, yielded a broad range of experience; pre-dating the Vietnam conflict and up to and including present day operations in Afghanistan and Iraq. Reviewing the facts provided by interviewees resulted in two, major data sets. The first set produced common elements present in all contingency airspace operations over the past four decades. The

consequences of both positive and negative airspace planning and execution were revealed in this data, providing support for answering primary and secondary questions. The second data set provided individual observations that also proved critical to answering research questions; however, this information was supplement in character and is only useful when applied in context with specific operating environments.

Common Elements to Integrated Airspace Operations

Subject matter experts provided a wealth of information on past, integrated airspace operations in a coexistent environment. These elements presented information that is regularly accepted by the airspace management community as standard operating requirements, limitations, and challenges, and through introduction are directly proportional to the level of success attained during integrated operations. In other words; airspace, regardless of type, is dynamic in an ever-changing environment and requires the ACA to appropriately resource these functions based on current conditions and events. With this providing a backdrop, research identified the following elements as common factors in integrated airspace management.

Air Traffic Services Infrastructure. This element addresses the airspace structure and navigational capability inherent in the operating environment. Subordinate factors impacting this element are airspace regulation, navigational aids, and overall air traffic control capability. The first factor, airspace regulation, is accomplished through established procedures and standards. This includes ICAO-acceptable airspace classification to support VFR and IFR flight operations. Next, is the use and certification of navigational aids that meet or exceed ICAO standards. Navigational aids include ground-based omni-directional beacons, distance measuring equipment, and global

position system satellite coverage. The final factor is terminal and en-route air traffic capability (including radar coverage) that is acceptable for US employment and recognized as usable by the Department of Transportation.

Host Nation Organizational Affiliation. This element specifies the host nation(s) membership in international and regional air traffic consortiums or party to inter-service agreements. Examples of this factor are membership in ICAO, third-party air traffic service providers; for example, EUROCONTROL, or existing military control from an on-going operation.

Existing Coalition or Joint Airspace Organizational Structure. Existing relationships, as formalized under a command and control structure, is a key planning function. This includes AOC airspace cell staffing (for contingency operations), and the level of fidelity between airspace managers and other pertinent control agencies. Subordinate factors include internal and external AOC interaction with the former focusing on the ability to successfully interact with other AOC divisions and cells. Examples include coordination with air battle managers, the Regional Air Movement Control Center, and A3 Airfield Operations or Air Traffic Control Cell. The latter is aimed at integration of planning and execution functions external to the AOC, but within the purview of the ACA. This includes terminal and en route air traffic airspace established throughout the operational area.

Interagency Coordination. The ability of airspace managers to plan and execute airspace management functions with external agencies. This applies to both control functions (physical air traffic control performed by noncoalition or third parties) and planning criteria when the selected airspace is in a heavily congested area.

Geopolitical and Economic Factors. Airspace management becomes quickly complicated in politically sensitive areas or when negative economic impacts are anticipated or realized. In these instances, airspace management becomes more than a tool for the safe and efficient movement of air traffic. Under these conditions, it takes on a new dynamic that includes broader strategic objectives.

Communications. This entails a wide array of communications infrastructure ranging from air-to-ground radios to landlines and data systems. A failure to obtain communications conductivity, at any level, directly impacts the level and ability to effectively manage airspace.

Support Functions. These peripheral essentials include maintenance, budget, and manpower activities required to sustain the level of airspace and air traffic services required.

These common elements attest to the level or complexity required for successful airspace management, inasmuch that fielding this much capability in manpower and equipment requires a focused effort by the ACA. Also of note, interviewees were extremely consistent in identifying these functions, stating effective and deficient elements in similar manner.

Supplemental Observations

In addition to the common elements, research also identified secondary elements required for effective airspace management. These functions proved to be situational dependent, based on the nature of the contingency paired with a specific operational environment. At this point in the research, interviewee inputs, based on differing backgrounds and knowledge, diverged from a general consensus. These elements are:

Training. The majority of research experts commented on the level of combat and conventional airspace management training provided to personnel (based on Afghanistan and Iraq operations). This included initial and proficiency training for airspace managers and air traffic controllers. In one example, it was well documented that the USAF conducted initial combat and conventional airspace training courses for deploying personnel; however, some experts stated that not everyone goes through it, hence they show up (in theater) without the proper train-up. Moreover, qualification also addressed the lack of basic air traffic control skills in both terminal and en route operations. It was believed by interviewees that controllers not familiar with conventional airspace builds, the full array of terminal air traffic services, or en route operations greatly extended the time required to integrated combat and conventional operations. This forced the ACA to contract en route air traffic control operations in Afghanistan (although this was not the single issue that drove that decision), and develop a "spin-up" en route training program for military controllers serving in Iraq. Additionally, the proficiency of airspace managers was an issue. This factor proved somewhat evasive, in the sense that proficiency is not always a tangible indicator of airspace management acumen. An airspace manager may be completely proficient at handling a small, low-impact contingency, but completely lost during full-spectrum operations. Nevertheless, feedback indicated that airspace management was not routinely or purposely exercised in a simulated contingency environment.

Experience. Research experts placed a high-value on this factor, but not to the point where it qualified as a common element. This difference is explained through

current operations in Afghanistan and Iraq were relatively inexperienced airspace managers successfully managed extremely complex airspace environments.

Relationships. This element does not mean interagency cooperation, organizational fidelity, or any other form of operational coordination. Surprisingly, it is aimed at personal relationships between airspace managers and their air traffic control counterparts. To explain this, the interviewees indicated the personnel who lead airspace management efforts, especially during contingency operations, are drawn from a small pool who have known each other for extended periods of time. Although this appears to be a somewhat unformulated factor, many experts felt it was enough of an issue to mention it.

Organizational Distance. This element focused on the organizational distance between the ACA and his or her airspace management functional. Under current doctrine, airspace managers are organizationally situated in lower-echelons, usually lead by a mid-tier officer (major or captain). This prevents airspace issues from migrating up the chain of command until they become an immediate problem. This delays efforts to correct airspace deficiencies and usually resulted in a less than optimal solution.

Interoperability. This defines the capability to successfully integrate into existing or concurrently operated airspace management and air traffic control functions. It exceeds communication or mechanical utility and is aimed at overlapping organizational structures and supporting procedures. An example of interoperability is the ability for air battle managers and air traffic controllers to effectively operate within the same airspace sector; mutually supporting each other's mission.

Subject matter expert data is summarized in table 1. The interview process used for this study proved productive and indispensable in evaluating the state of past airspace operations. Although extremely time consuming, especially in the nondirective interview technique used (a word of caution for future researchers); it produced data that was not readily available.

Table 1. Elements Effecting of Airspace Control

ELEMENT	COMMON	SUPPLEMENTAL
1	Air Traffic Services Infrastructure	Training
2	Host Nation Organizational Affiliation	Experience
3	Existing Coalition or Joint Airspace Organizational Structure	Relationships
4	Interagency Coordination	Organizational Distance
5	Geopolitical and Economic Factors	Interoperability
6	Communications	
7	Support Functions	

Case Studies

The elements identified above provided the framework for this work's analysis as it related to practical application; however, these elements cannot answer the primary and secondary questions on their own. To do that an additional review, in the form of case studies was needed; correlating the aforementioned elements as applied during past contingency operations. Of note, this was not a "weighted" effort; attempts to assign numerical value to these elements proved fruitless based on unique conditions of each contingency operation. Either these elements were available at the appropriate threshold and aided in successful operations or they were absent, mitigating overall effectiveness.

This researcher selected Joint Task Force (JTF) Katrina (figure 3) and Balkans air operations as case studies. JTF Katrina was used because it represents a well established civil-military airspace relationship, albeit one based on static operational framework vice that of a deployed location. As for Balkan operations, it was selected based on recommendations by research participants, two of whom where key players during early Balkan air traffic operations. Likewise, these interviewees and the researcher felt the Balkan airspace operations were more representative of the future airspace architecture under CNS-ATM, thus providing a more realistic scenario.

Figure 3. Air Operations during Joint Task Force Katrina

Source: Master Sergeant Bill Huntington, *Air Force Link,* 2005 [photo on-line]; available from http://www.af.mil/photos/media_search.asp?q=katrian+Huntington&btnG.x=5&btnG.y=14; Internet; accessed on 5 December 2006.

Case Study 1: Joint Task Force Katrina

Hurricane Katrina struck the US Gulf Coast on 29 August 2005. This storm, characterized as "the most destructive natural disaster in American history"[27] killed over

1,300 people,[28] and laid waste to the airport and air traffic infrastructure in the Gulf region. In the wake of this disaster, US Northern Command established JTF Katrina to direct and coordinate the military response.[29]

The researcher used the JTF Katrina Airspace Control Plan (ACP) (appendix B) as the primary source selected for this case study, focusing on the standing relationship between the US military forces and the FAA. This plan, published by the USAF's 1st Air Force during the Hurricane Katrina national response, is inclusive of both conventional and combat airspace management in coexistent environment. Additionally, it used existing doctrine and published guidance as sourced references.[30] It proved to be a positive example of airspace integration, and its success was lauded in the White House's *The Federal Response to Hurricane Katrina: Lessons Learned*.

> The Department of Transportation (DOT) successfully coordinated one of the largest airlifts in its history to support the emergency evacuation of more than 66,000 citizens from New Orleans. This large and complex operation involved three federal Departments and a fleet of private sector and military aircraft.[31] Additionally, the DOT *Federal Aviation Administration* quickly restored air traffic control and runway operations at the Louis Armstrong International Airport in New Orleans. This not only facilitated the delivery of relief supplies into the area, but also enabled federal authorities to execute a massive airlift of New Orleans evacuees. The Air Transport Association also coordinated forty domestic flights with continual DOD and civilian flights to evacuate a total of 24,000 people.[32]

Reviewing the JTF Katrina ACP, it was appropriate to correlate its inclusion of the aforementioned common elements, to gauge its success as an actionable document.

Air Traffic Services Infrastructure: This was a default condition, since these operations took place within US airspace with its full array of communications, air traffic organizations, and equipment. The challenge presented was providing a "stop-gap"

capability, utilizing military assets until the FAA could restore services degraded by hurricane damage.[33]

Host Nation Organizational Affiliation. The US is an ICAO signatory and consequently implements widely accepted airspace management standards and practices. This was not only important for domestic airspace users, but for foreign entities who wished to aid the US relief operations.

Existing Coalition or Joint Airspace Organizational Structure. Like air traffic services infrastructure, this to was a default condition. As previously mentioned, the US has well-established military-civil support structure, which was addressed and utilized.[34] An important distinction in this element is this support structure, in place for decades, was a product of both US Northern Command's air component (1st Air Force) and US Northern Command's organizational sister command, the North American Air Defense Command. The corollary is the involvement of JFC-level echelons.

Interagency Coordination. Military-civil coordinating procedures are presented throughout this plan with emphasis on which agencies are responsible for a particular function and how to contact the appropriate personnel.[35]

Geopolitical and Economic Factors. Due to the nature of this contingency (natural disaster/humanitarian response), this element is not addressed in the ACP. That is not a fault, inasmuch that flight safety was the stated primary effort during initial operations. However, this observation did not preclude a geopolitical or economic dynamic to Katrina airspace operations.

Communications. Apparently, the ACP counted on communications conductivity between command and air traffic control facilities. This is appropriate since US air traffic

facilities have redundant communications capabilities that provide alternative means of conductivity at various operational and tactical levels. Although not always optimal or convenient, alternate communications are a viable means to exercise airspace control.

Support Functions. Not an issue for this particular operation. The ACA had the full weight of the FAA and DoD to execute the airspace control mission.

In addition to the common elements of airspace control, the supplement elements also played roles in the JTF Katrina ACP, to varying degrees.

Training. Although not documented in the ACP, the airspace managers and air traffic controllers were assumed to be fully qualified; a product of the strict standardization and evaluation process inherent in US air traffic operations. It should be noted that US military controllers, like their civilian counterparts, are licensed by the FAA, not DoD.

Experience. The experience of airspace managers and controllers falls primarily under the same guidelines as training; at least in this instance. Moreover, the level fidelity found in the JTF Katrina ACP speaks to experience in the sense this document proved successful. Airspace management and its subordinate air battle and air traffic functions are a complex effort; devising a winning plan to support this particular operation is, in itself, an indicator of experience.

Relationships. This element was not a factor based on the previously mentioned existing relationship between the FAA and DoD. The use Air Defense Liaison Officers substantiates this conclusion.[36]

Organizational Distance. The researcher approximated the impact of this supplemental element based on the scope of operations. JTF Katrina was established

within the framework of an existing command relationship; therefore, any organizational distance would be incident to emergent requirements. Since airspace control takes on a different dynamic inside a standing organizational structure, anomalies would be anticipated and appropriately mitigated.

Interoperability. JTF Katrina airspace managers included this element in the ACP. This is demonstrated in both operational procedures and tactical airspace rules.[37]

Evaluating JTF Katrina airspace operations, via the ACP, and measuring the use of doctrine coupled with practical application of airspace elements, research found airspace managers and controllers developed a fully integrated combat and conventional airspace environment. This success can be traced to two main elements. First, the airspace management team clearly defined the capabilities of military command and control facilities (combat airspace) as they relate to air traffic service, and delineated operational responsibilities between civilian and military airspace control.[38] This was crucial to building a joint operation that linked the use of civil and military assets. Second, airspace mangers effectively leveraged the standing relationship and mutual support agreement between the FAA and DoD into a well-coordinated, singularly focused operating atmosphere capable of interacting together and separately. This provided the capability and flexibility to meet mission requirements through both feasible and operable airspace architecture.

Case Study 2: Initial Balkans Intervention

The second case study focused on NATO's initial entry into the Balkans (airspace over and adjacent to the former Yugoslavia) to implement the 1995 Dayton Peace accords and provide humanitarian relief. In contrast to JTF Katrina, this operation

involved several countries operating inside the airspace of several host nations. Moreover, this contingency operation required the US, acting under the auspices of NATO's Implementation Force, to deploy airspace managers and air traffic control personnel to locations where there was not a standing relationship between military-civil agencies at the operational or tactical level. The researcher's primary source for this review was based on interviews. As previously stated, two of participants were key players in this operation and provided a wealth of information on its initial operation and follow-on efforts.

Reviewing Balkan airspace operations, and applying common and supplemental elements, research discovered the following information.

Air Traffic Services Infrastructure: The airspace infrastructure in the Balkans was subject to ICAO standards and practices; however, it was not consistently uniform. Research indicated the air traffic infrastructure was inadequate in terminal areas, requiring the deployment of mobile air traffic assets. Fortunately, the Balkans did possess an en route radar capability situated at Zagreb, Croatia. Ground-based navigational equipment, although operational, proved untrustworthy.

Host Nation Organizational Affiliation. The host nations involved subscribed to ICAO conventions; however; many were new members (following the break-up of Yugoslavia) who had not fully implemented acceptable standards and practices.

Existing Coalition or Joint Airspace Organizational Structure. The existing US European Command air component, US Air Forces Europe, utilized the Combat-AOC structure, sited at Vicenza, Italy (figure 4). Additional airspace mangers where assigned to this facility during Balkan operations. This was a NATO operation so it required

research into NATO's published guidance. The two, key Allied Joint Publications were Allied Joint Publications 3.3, *Joint Air and Space Operations,* and 3.3.5(A), *Doctrine for Joint Airspace Control*. Although unclassified, these documents are restricted for release outside NATO channels. Nevertheless, research indicated there is nothing in these publications that openly conflicted with US-directed airspace operations when applied to this case study.

Figure 4. Combat Airspace Operations Center, Vincenza, Italy

Source: Marcella F. Adams, "Controlling the Bosnian Skies," *Airman Magazine,* August 1996 [photo on-line]; available from http://www.af.mil/news/airman/0896/caoc.htm; Internet; accessed on 15 August 2006.

Interagency Coordination. Internal to NATO members, interagency coordination was institutionalized. Conversely, outside military channels little or no coordination relationships existed. Airspace managers overcame this obstacle by placing air traffic controllers at Zagreb and deploying air traffic equipment and personnel to terminal areas.

Research indicated interagency coordination was slow to build, but once established, it became the linchpin for airspace operations.

Geopolitical and Economic Factors. Research experts stated there were political and economic concerns that impacted airspace operations. Politically, the airspace was not fully under the control of affected host nations, requiring their air traffic personnel to requests permission from NATO to conduct domestic operations. Economically, interviewees felt there was pressure from government agencies to quickly reestablish civilian air commerce as both a revenue-producing activity and to aid in humanitarian assistance.

Communications. This element proved problematic, requiring the installation of additional communications capability. This installation was measured in weeks, not days, and forced airspace managers and controllers to use alternate communications.

Support Functions. Based on research, this element proved vital to establishing integrated operations. In fact, participating experts were quite clear that they received stellar support. Had this not occurred, airspace management capability "would have significantly suffered." Notwithstanding, participants also relayed that certain support requirements outside those normally associated with airspace management but required for this operation, did affect the timeliness for establishing efficient operations.

Moving to supplemental elements, reesearch revealed the following.

Training. This proved to be an on-going challenge, especially in staffing the Zagreb en route air traffic center with qualified personnel. As previously stated, the USAF didn't have an en route air traffic control training program, forcing the service to selectively undertake a search for personnel with the required skill sets.

Experience. Like its training counterpart, this element faced the same issues in locating and assigning en route qualified controllers. However; in this instance, controllers with en route experience alleviated the training shortfall and were able to establish a qualification program for follow-on replacements.

Relationships. Based on research data, relationships between airspace managers in the AOC and air traffic controllers proved decisive. Case study experts stated they personally knew, had worked with, and trusted "the guys on the other end of the line because they were a know quantity." Moreover, interviewees believe that in certain situations, these relationships produced an additional level of safety through open, interpersonal communication, unhindered by a formalized, organizational coordination structure.

Organizational Distance. US Air Forces Europe conducted this operation under the AOC organizational structure. Since research revealed organizational distance exists within this structure, it is appropriate to presume it was present. One expert validated this assumption stating: "airspace issues didn't become issues; until they became problems."

Interoperability. This element also proved pivotal, inasmuch it required overlaying different organizational elements into a relatively small airspace environment. These elements included ICAO agencies, EUROCONTROL, NATO forces, and several host nations. Research indicated NATO attained interoperability after a lengthy transition phase, based mostly on necessity vice planning.

Evaluating Balkan airspace operations, research indicated a deficit within the common elements of airspace control, yet these deficiencies were diminished through application of supplemental elements. Amplifying this finding, examples include

overcoming procedural and support shortfalls with relationships, mitigating deficient air traffic infrastructure with training and experience, and attaining interoperability to offset interagency coordination problems. Nonetheless, Balkan air operations, from a historical perspective, were successful even though research pointed out it took time to build the structure and organizational relationships needed to meet the JTF commander's expectations.

Case Study Summary

This author undertook both case studies as standalone prospects and not intended as a compare and contrast evaluation when placed against each other. Nevertheless, one might find it inescapable to not draw some distinction between these two operations; one where all the elements of airspace control were available and brought to bear (if required) to attain success, and one where airspace managers leverage varying degrees of individual elements to achieve the same results. In any case, the case studies validated the elements found during research and demonstrated how they are applied in a practical environment. From a methodology and analysis perspective, there may appear to be some conflict in developing common and supplemental elements from interviewees, and then using those same elements to evaluate a case study in which they participated. It is important for readers and future researchers to know these elements, although garnered from some Balkan-related interviews were in fact, the result of contributions from other experts and research study.

Conclusion

This research is an attempt to address airspace management from a different perspective; above and beyond routine results found through lessons learned and after action reports. While these two methods have served the airspace control community well, they tend to focus on repairing individual aspects of a problem, utilizing doctrine, procedures, and standards to either meet or define new requirements. In essence, lessons learned and after-action report systems are reactive in nature. This effort focused on being proactive, using doctrine, guidance, and feedback applied to practical environments to uncover how and why specific aspects of airspace integration do or do not work in a specific setting, and to determine what improvements can be implemented.

---

[1]Chairman, Joint Chiefs of Staff, Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone* (Washington, DC: GPO, 2004), III-2.

[2]Chairman, Joint Chiefs of Staff, Joint Publication 3-52, *Doctrine for Joint Airspace Control in the Combat Zone* (Washington, DC: GPO, 1995).

[3]Chairman, Joint Chiefs of Staff, Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone* (Washington, DC: GPO, 2004), iii.

[4]Air Land Sea Application Center. Field Manual 3-100.2; Marine Corps Reference Publication 3-25D; Navy Tactics, Techniques, and Procedures 3-52.1(A); and Air Force Tactics, Techniques, and Procedures(1) 3-2.16, *Multiservice Procedures for Integrated Combat Airspace Command and Control* (Washington, DC: GPO, 2000), I-2.

[5]Ibid., F, 4

[6] Air Land Sea Application Center, Field Manual 3-52.3; Marine Corps Reference Publication 3-25A; Navy Tactics, Techniques, and Procedures 3-56.3; and Air Force Tactics, Techniques, and Procedures(1) 3-2.23, *Multiservice Procedures for Joint Air Traffic Control* (Marine Corps: PCN 1440000380, 2003), Appendix F

[7]Headquarters, Air Force Doctrine Center, Air Force Doctrine Document 2.1-7, *Airspace Control in the Combat Zone* (Maxwell AFB, AL: Air University Press, 2001), 29.

[8]Ibid., 2.

[9]Ibid., 30.

[10]Ibid.

[11]Department of the Air Force, Air Force Instruction13-1, vol. 3, *Operational Procedures, Air and Space Operations Center* (Washington, DC: GPO, 2005), 61.

[12]Department of the Army, Field Manual 3-52, *Army Airspace Command and Control in a Combat Zone* (Washington, DC: GPO, 2002), 5-1.

[13]Ibid., C-13.

[14]Air Land Sea Application Center, B1-9.

[15]Department of Navy, Marine Corps Warfighting Publication 3-25.7, *Tactical Air Operations Center Handbook* (Washington, DC: GPO, 1996), 1-1.

[16]Ibid., A-17.

[17]Alexander M. Wathen, "The Miracle of Operation Iraqi Freedom Airspace Management," *Air and Space Power Journal*, 4 October 2005 [chronicle on-line]; available from http://www.airpower.maxwell.af.mil/airchronicles/cc/wathen.html; Internet; last accessed 25 November 2006.

[18]International Civil Aviation Organization. Making an ICAO Standard, Forms of Recommended Standards and Practices (Montreal, Canada: 2004); available from http://www.icao.int/cgi/goto_m.pl?/icao/en/anb/mais/index.html; Internet; accessed 7 September 2006.

[19]Ibid.

[20]Ibid.

[21]Ibid.

[22]Ibid.

[23]Ibid.

[24]EUROCONROL, *Harmonization of Operational Air Traffic and its General Air Traffic Interface (HOGI)* (Brussels, Belgium: 2006); available from http://www. eurocontrol.int/mil/public/ standard_page/atm_mil_hogi.html; Internet; accessed on 24 November 2006

[25]Ibid.

[26]Ibid.

[27]White House, *The Federal Response to Hurricane Katrina, Lessons Learned*, Chapter Five*:* Lessons Learned (Washington, DC: GPO, 2006), 1.

[28]Ibid.

[29]Ibid., 42.

[30]Headquarters, First Air Force, Airspace Control Authority, *Joint Task Force Katrina Airspace Control Plan* (Tyndall Air Force Base, FL: GPO, 2005), 1.

[31]White House, *The Federal Response to Hurricane Katrina, Lessons Learned*, Chapter Five: *Lessons Learned* (Washington, DC: 2006), 136.

[32]US Department of Transportation, "DOT Activities in Support of Federal Response to Hurricane Katrina," News release, 5 September 2005.

[33]Ibid., 131.

[34]Headquarters, First Air Force, Airspace Control Authority, *Joint Task Force Katrina Airspace Control Plan* (Tyndall Air Force Base, FL: GPO, 2005), 6.

[35]Ibid., 5-6.

[36]Headquarters, First Air Force, 6.

[37]Ibid., 3 and 6.

[38]Ibid.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Based on the analysis done in Chapter 4, this research found answers to the primary and secondary questions. Additionally, these findings also produced information on how airspace managers and their subordinate functions can improve combat and conventional airspace integration. Here is a review the problem statement, primary and secondary questions.

The problem statement for this research asserted the simultaneous control of combat and conventional airspace is a primary challenge for US air components and coalition partners (if present) engaged in military operations. Airspace control is defined as “rules of the air,” instituted for maximum application of combat operations and cognizant of the needs from a myriad of other airspace users, ranging from commercial airlines to state-operated (including military) aircraft. The overarching goal of airspace control is to prevent the collision between airborne assets while concurrently providing efficient use of combatant command allocated airspace. Military and civilian airspace managers have found this to be a daunting task over the past two decades, based on the complexity and capability of weapon systems, geopolitical factors of airspace sovereignty, and economic aspects derived from airspace commercialization. This simultaneous use of combat and conventional airspace control will only continue to grow as military operations compete with commercial interests in a finite airspace environment.

The primary question posed under this work asked, based on needs of Joint Force Commanders, via the ACA, to integrate combat and conventional airspace against a backdrop of geopolitical and economic pressures; what is the most efficient means or protocol to regulate coexistent airspace? Secondary questions included; what agencies or organizations are best suited for building an integrated airspace control plan? What facility or apparatus is best suited for controlling coexistent airspace operations? And finally, what set of international rules best serves to regulate coexistent airspace?

Findings

Based on the analysis, this author found three specific components that drive combat and civilian airspace integration during contingency operations. These components are: written guidance, common and supplemental elements of airspace management (herein referred to as 7-5 elements), and airspace architectural seams. The researcher introduced the first two components during analysis and will expand on them further in this chapter. The final component, architectural seams, is a product of this analysis and will be introduced as the final finding.

Written Guidance

As previously stated, it was found that there was not a shortage of published work on conventional and combat airspace operations. Prior to this study, the author mistakenly assumed written guidance, poorly scripted or parochial in nature, helped propagate deficiencies in airspace integration. While military services and their civilian counterparts can improve on current products, the overall availability and content of current publications are adequate. International, domestic, military, or third party

guidance appeared to address airspace integration to varying degrees. Although research indicated most of these products lacked detail into specifically how integration takes place, current guidance in its entirety covered varying degrees of airspace integration and directed readers to supporting agencies or publications.

Five common themes to current publications were discovered. The first of these is the ACA has a responsibility to build airspace control relationships. That is to say, integrated combat and conventional airspace integration is fundamental to overall mission success, requiring attention during planning and constant updating throughout execution. The second theme offers that standardized rules are required for safe and efficient integration. These rules may or may not already be published. In the latter instance, a joint rule-making approach is required in order to meet all users' needs. The third theme finds coexistent airspace environments are not always possible and therefore, must be separated. Examples are ACA established no-fly-zones and temporary flight restrictions areas. In these instances, the ACA must be prepared to endure political pressures incident to geopolitical and economic concerns. In that regard, the next theme indicates geopolitically or economic aspects are rarely addressed and when they are, the primary means is through military and civil declarations or requests. These declarations and requests, sometimes implemented without prior airspace coordination, prove to be problematic for managers and personnel and result in less than optimal operations. The final theme suggests guidance is usually published based on the assumption that users possess advance knowledge and skill sets concerning airspace operations. This is a problematic condition; an air traffic control staff officer may have little trouble interpreting guidance, whereas an artillery officer, unfamiliar with the nuances of

airspace control, may find guidance obscure. These themes reflect both positive and negative aspects of airspace written procedures, and consequently, are useful background information for airspace managers and controllers.

The 7-5 Table

The Elements of Airspace Control, herein referred to as the "7-5 Table" (reproduced here as table 2) included the common and supplemental elements of airspace management. While these elements were a research-developed tool to evaluate case studies, their importance surpasses that function. These elements, garnered from subject matter expert inputs and written guidance (for example *JATC*), are the actual factors taking place inside airspace management construct. Moreover, they appear to exceed the scope of any single airspace subordinate function. In other words, these elements (in part or whole) may be just as important to an air battle manager establishing command and control as to an air traffic controller establishing an initial operating capability. This finding was a pleasant development in pursuit of this project. The 7-5 Table may prove to be useful to potential researchers or airspace management professionals, in both evaluating past operations and as a template for future operations.

Table 2. 7-5 Table

ELEMENT	COMMON	SUPPLEMENTAL
1	Air Traffic Services Infrastructure	Training
2	Host Nation Organizational Affiliation	Experience
3	Existing Coalition or Joint Airspace Organizational Structure	Relationships
4	Interagency Coordination	Organizational Distance
5	Geopolitical and Economic Factors	Interoperability
6	Communications	
7	Support Functions	

Airspace Architectural Seams

Research also uncovered airspace architectural seams as a determinate of airspace integration. These seams identify the organizational and physical borders within the coexistent airspace structure. They became apparent following data analysis; however, their presence was not readily identifiable. It was only after the researcher looked for second and third order effects incident to airspace integration that these seams coalesced into a definable component. Architectural seams are defined as seams between air battle management command and control and air traffic control, the JOA and adjacent host nation(s) airspaces, and JOA terminal air traffic control facilities, and operational airspace.

The first seam, between air battle management command and control and air traffic control, exists in coexistent airspace environments where rules and procedures compete against differing control facilities. This is more than just airspace integration at the tactical level; it also includes strategic and operational planning. In essence, this seam indicates air battle management and air traffic controllers integrate airspace through necessity and not method.

The seam between JOA and adjacent host nation(s) airspaces centers on the transitional area as airborne assets ingress or egress the JOA. Research indicated airspace managers and their subordinate functions find this area challenging, as it contains yet a third element of airspace control, based solely on conventional air traffic services operations and independent of JOA airspace planning functions. Key factors in this area are air-to-air or ground communications, identification of friend or foe interrogation, and operational security considerations.

The final seam is between JOA terminal air traffic control facilities and adjacent operational airspace. In the introduction to this thesis, it was stated that, combat airspace contains conventional terminal control, which is incidental to the combat airspace environment. This statement is a fallacy. Research found terminal air traffic control is very much a part of the overall airspace management equation, mostly centered on integrating conventional air traffic into the TAGS. Currently, it appears all services but the USAF fully integrates conventional air traffic assets into their component of the TAGS. While the USAF doctrinally integrates air traffic into the TAGS, research indicated this does not take place at the operational or tactical level. This is a deficiency because the USAF is equipped to provide the bulk of JFC-deployed conventional air traffic services. One should not interpret this seam as a duplication of the seam between air battle management and air traffic control. Repairing or mitigating that seam might alleviate the negative, operational impact of this seam but it would not solve the problem. This seam is more inclusive of the entire airspace environment, and comprises other airspace tasks; for example, range control or host-nation restrictions.

Reviewing architectural seams, knowledgeable readers might conclude these are obvious findings and already identified in publications such as *JATC*; however, research established they are the proverbial "white elephant in the room." While airspace agencies have published extensive works about the coordination and cooperation required for integrating airspace; these seams were not always defined in concrete terms. This disconnect primarily appears to be a function of who publishes guidance. If an organization publishes a command and control (air battle) document, then air traffic is a peripheral issue, and vice-versus when published by air traffic organizations. Research

also indicated secondary causes, based on training and experience, but the data was not fully conclusive. It should be noted that architectural seams nearly exceeded the scope of this work; these issues alone would make a suitable thesis or research project. In any event, these seams provide a challenge for current and future airspace professionals.

Recommendations: Answers to Secondary and Primary Questions

In order to answer the primary question, it is appropriate to start with secondary considerations. Data from this study suggest the best agency for building an integrated ACP is a modified version of the airspace management function inside the AOC. Specifically, the current organizational structure would combine the A-3 Airfield Operations functions (in part) with Airspace Management Cell within the AOC. Currently, these functions are organizational separated; however, some level of fidelity does exist between these units. Additionally, this organization would include expanded staffing drawn from coalition and joint participants, civilian air traffic representatives (in part-time adjunct status), affected host nations, ICAO or its subordinate agencies, and U.S. interagency partners. This recommendation is for an organizational structure above and beyond what is currently listed as an airspace integration entity (team or cell) in *JATC.* Of note, it should be stated that many of the interviewees for this research stated Central Air Forces leadership was moving in the direction of this recommendation. This action would produce a cohesive organization capable of producing a fully integrated air space control plan and subordinate publications.

When addressing what facility or apparatus is best suited for controlling coexistent airspace operations research indicted current organizational structures, aligned

under the subordinate airspace management functions of air battle management and air traffic control, work effectively. However, there is a shortfall in the level of fidelity between these functions, both in published guidance and working relationships. Airspace executive agencies can handle these deficiencies with various solutions, ranging from assigning liaisons to serving in each function's control centers, to collocating air traffic and air battle management facilities (another Central Air Force initiative) reminiscent of the Vietnam-era ATRACs. In any case, data collected for this project pointed to a discrepancy between these subordinate functions that will increase the risk in future airspace environments.

The final question centered international rules, and which set best serves to regulate coexistent airspace. When addressing this issue, one should note there two sets of rules in play; those used to handle combat airspace organizations and those used for conventional air traffic operations. As for the former, there are not any international rules, only those established by the civil-military agreements, joint or service doctrine, agency-specific guidance, and TTPs. Under this framework air battle management is not an air traffic function and its controllers are not licensed to control conventional operations. Air battle managers receive certification to control participating aircraft under specific conditions. While trained on certain elements of conventional air traffic operations, their span of control is limited to the JOA. On the other hand, US military air traffic controllers are licensed by FAA, to control all air traffic, military and civilian, but are not routinely trained in air battle management to include joint terminal attack control. Of course, there are exceptions to these rules that further complicate this subject; for example, combat controllers, tactically certified air traffic controllers, and specially developed rules for air

base defense sometimes blur these lines between these distinct disciplines. Research was not definitive on solutions to this half of the issue, other than the aforementioned effort to liaise between these two functions and instituting some form of joint training. Further study in this area is recommended. As for strictly conventional operations, air traffic controllers currently utilize ICAO standards and practices, and research indicates they should continue to do so. This author does not recommend the development of any special rules or procedures for JOA conventional air traffic operations; especially in light of CNS-ATM initiatives. This recommendation is exclusive of those rules and practices, instituted between air battle and air traffic control agencies, predicated on operational necessity.

The primary question of this thesis was; based on needs of Joint Force Commander, via the ACA, to integrate combat and conventional airspace against a backdrop of geopolitical and economic pressures, what is the most efficient means or protocol to regulate coexistent airspace? For this study, research produced answers and recommendations focusing on organizational structure, planning, and execution.

Organizational, research indicated airspace management functions, from a strategic policy perspective, needs to originate from Joint Force Command, specifically the US geographical Combatant Commands. In today's structure, airspace management is handled by a "lead service" assigned to a Joint Force Command or subordinate, and solidified under the JFACC at the operational level. This arrangement works and handles the operational and tactical components of utilizing airpower. However, as stated, the goal is to duplicate existing, successful models (US and Europe) where airspace managers do not have to "figure out" the airspace in the midst of a fight or contingency.

The only feasible avenue for attaining that level of operability is for the Combatant Commands to establish a strategically orientated airspace function, appropriately staffed, capable of developing relationships airspace agencies within its respective area of responsibility. Research indicated this proposal has been fielded in the past, but due to resource constraints, is slow in coming to realization.

Planning is a component within the aforementioned combatant command's airspace operations. While there is no doubt the J-3 Directorate within each Combat Command has an assigned airspace planning function with staff officers toiling away at developing operational plans and orders, there is a question, at least in the minds of this project's interviewees, if the right skill sets are present. Data was inconclusive on this point; it did indicate there has been, and is, strategic-level airspace decision and policy-making taking place at the operational level in absence of higher headquarters guidance. This appears to work in the contemporary operating environment, yet data indicates CNS-ATM and its associated political and economic factors may quickly outstrip the capability currently embedded inside a subordinate components. In this instance, research recommends that a strategic-level airspace planning capability is placed at the Combatant Commands in order to deal with future airspace considerations.

The final factor research considered is execution and in this instance it is based on the forces generated to support a contingency. Basically, the best method or protocol for controlling integrated airspace is to have a pool of highly trained and qualified personnel who can accomplish this complex mission over a wide-array environments and disciplines. Research indicated a greater level of joint training needs to exist between airspace managers, air battle managers, and air traffic controllers. While this research did

not support what type or degree of training is required, it indicated that cross-utilization and training is a linchpin in future airspace operations. Joint Force commanders need personnel that understand the overarching requirements of airspace control and can speak to the various users. That end will only come to pass when DoD builds “a better” controller, conversant in several airspace control missions.

This author did not undertake this study in order to find a panacea for the challenges facing integrated airspace operations. Joint Force Commands could implement the findings and recommendations tomorrow, yet there would be new challenges based on the global nature of airspace operations. However, it was a study based on approaching airspace operations from a different direction with the goal of finding answers and options to systemic problems that continually plague contingency operations. In that effort, much was learned and it is hoped that readers gain some level of usefulness.

GLOSSARY

Air Corridor. A restricted air route of travel specified for use by friendly aircraft and established for the purpose of preventing friendly aircraft from being fired on by friendly forces (JP 1-02).

Airspace Control Area. Airspace that is laterally defined by the boundaries of the operational area. The airspace control area may be subdivided into airspace control sectors (JP 1-02).

Airspace Control Authority. The commander designated to assume overall responsibility for the operation of the airspace control system in the airspace control area. Also called ACA. See also airspace control; airspace control area; airspace control system (JP 1-02).

Airspace Control Boundary. The lateral limits of an airspace control area, airspace control sector, high-density airspace control zone, or airspace restricted area (JP 1-02).

Airspace Control in the Combat Zone. A process used to increase combat effectiveness by promoting the safe, efficient, and flexible use of airspace. Airspace control is provided in order to reduce the risk of friendly fire, enhance air defense operations, and permit greater flexibility of operations. Airspace control does not infringe on the authority vested in commanders to approve, disapprove, or deny combat operations. Also called airspace control; combat airspace control (JP 3-52).

Airspace Control Order. An order implementing the airspace control plan that provides the details of the approved requests for airspace coordinating measures. It is published either as part of the air tasking order or as a separate document. Also called ACO (JP 1-02).

Airspace Control Plan. The document approved by the joint force commander that provides specific planning guidance and procedures for the airspace control system for the joint force operational area. Also called ACP (JP 1-02).

Airspace Control System. An arrangement of those organizations, personnel, policies, procedures, and facilities required to perform airspace control functions. Also called ACS (JP 1-02).

Airspace Coordinating Measures. Measures employed to facilitate the efficient use of airspace to accomplish missions and simultaneously provide safeguards for friendly forces. Also called ACMs. See also airspace control area; airspace control boundary; airspace control sector; airspace coordination area; high-density airspace control zone; weapons engagement zone (JP 1-02).

Airspace Management. The coordination, integration, and regulation of the use of airspace of defined dimensions (JP 1-02).

Airspace Restrictions. Special restrictive measures applied to segments of airspace of defined dimensions (JP 1-02).

Air Tasking Order. A method used to task and disseminate to components, subordinate units, and command and control agencies projected sorties, capabilities and/or forces to targets and specific missions. Normally provides specific instructions to include call signs, targets, controlling agencies, etc., as well as general instructions. Also called ATO (JP 1-02).

Air Traffic Control Facility. Any of the component airspace control facilities primarily responsible for providing air traffic control services and, as required, limited tactical control services (JP 1-02).

Combined Operation. An operation conducted by forces of two or more Allied nations acting together for the accomplishment of a single mission (JP 1-02).

Coordinating Altitude. A procedural airspace control method to separate fixed- and rotary-wing aircraft by determining an altitude below which fixed-wing aircraft will normally not fly and above which rotary-wing aircraft normally will not fly. The coordinating altitude is normally specified in the airspace control plan and may include a buffer zone for small altitude deviations (JP 1-02).

High-Density Airspace Control Zone. Airspace designated in an airspace control plan or airspace control order, in which there is a concentrated employment of numerous and varied weapons and airspace users. A high-density airspace control zone has defined dimensions which usually coincide with geographical features or navigational aids. Access to a high-density airspace control zone is normally controlled by the maneuver commander. The maneuver commander can also direct a more restrictive weapons status within the high-density airspace control zone. Also called HIDACZ (JP 1-02).

Identification, Friend or Foe/Selective Identification Feature Procedures. The directives that govern the use of identification, friend or foe selective identification feature equipment. See also identification, friend or foe (JP 1-02).

Joint (Combined) Force Air Component Commander. The commander within a unified command, subordinate unified command, or joint task force responsible to the establishing commander for making recommendations on the proper employment of assigned, attached, and/or made available for tasking air forces; planning and coordinating air operations; or accomplishing such operational missions as may be assigned. The joint force air component commander is given the authority necessary to accomplish missions and tasks assigned by the establishing commander (JP 1-02).

Joint (Combined) Force Commander. A general term applied to a combatant commander, subunified commander, or joint task force commander authorized to exercise combatant command (command authority) or operational control over a joint force. Also called JFC (JP 1-02).

Joint Operations Area. An area of land, sea, and airspace, defined by a geographic combatant commander or subordinate unified commander, in which a joint force commander (normally a joint task force commander) conducts military operations to accomplish a specific mission. Joint operations areas are particularly useful when operations are limited in scope and geographic area or when operations are to be conducted on the boundaries between theaters. Also called JOA (JP 1-02).

Multinational Operations. A collective term to describe military actions conducted by forces of two or more nations, usually undertaken within the structure of a coalition or alliance (JP 1-02).

Operational Area. An overarching term encompassing more descriptive terms for geographic areas in which military operations are conducted. Operational areas include, but are not limited to, such descriptors as area of responsibility, theater of war, theater of operations, joint operations area, amphibious objective area, joint special operations area, and area of operations (JP 1-02).

Positive Control. A method of airspace control that relies on positive identification, tracking, and direction of aircraft within an airspace, conducted with electronic means by an agency having the authority and responsibility therein (JP 1-02).

Procedural Control. A method of airspace control which relies on a combination of previously agreed and promulgated orders and procedures (JP 1-02).

Radar. A radio detection device that provides information on range, azimuth, and/or elevation of objects (JP 1-02).

Restricted Operations Area. Airspace of defined dimensions, designated by the airspace control authority, in response to specific operational situations/requirements within which the operation of one or more airspace users is restricted. Also called ROA (JP 1-02).

Service Component Command. A command consisting of the Service component commander and all those Service forces, such as individuals, units, detachments, organizations, and installations under that command, including the support forces that have been assigned to a combatant command or further assigned to a subordinate unified command or joint task force (JP 1-02).

Unmanned Aerial Vehicle. A powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload. Ballistic or semiballistic vehicles, cruise missiles, and artillery projectiles are not considered unmanned aerial vehicles. Also called UAV (JP 1-02).

APPENDIX A

CONVENTIONAL AND COMBAT AIRSPACE COMPONENT COMPARISON

The following depicts an approximate comparison between conventional and combat airspace control systems, structures, and facilities within coexistent environments. This is an author-derived interpretation.

CONVENTIONAL	COMBAT
Systems and Structures	
Flight Information Region	Joint Operations Area
National Airspace System User Interface (Flight Planning and Execution – IFR/VFR)	Air Tasking Order
National Airspace System Structure Airspace Classification Airways Special Use Airspace Air Traffic Control Assigned Airspace	Airspace Control Plan Airspace Control Order Special Instructions (SPINs)
Facilities	
[1]FAA Air Traffic Control System Command Center (National)	Air Operations Center
[2]Flight Service Station	Army Airspace Information Center Air Support Operations Center Navy Tactical Airspace Control Center Marine Tactical Control Center
Air Route Traffic Control Center Area Control Center	Control Reporting Center Ground Component Airborne (AWACS, JSTARS, E-2) Marine Tactical Air Operations Center
Radar Approach Control Terminal Radar Approach	Control Reporting Element Direct Air Support Center Forward Air Controller - Airborne
Air Traffic Control Tower	[3]Combat Control Team [4]Tactical Air Traffic Control Tactical Air Control Party Forward Air Controller - Ground
National Airspace System Navigational Components	Deployable Air Traffic Control and Landing Systems (Navigational Aids)

[1]Or host nation equivalent.
[2]Conventional and Combat Facilities are depicted in supervisory/command precedence. Exception: Flight Service Stations are subordinate to all conventional air traffic functions.
[3]Combat Controllers can perform either conventional or combat airspace control; although when executing the former, it is limited to VFR or tactical instrument condition operations
[4]Tactical air traffic controllers, employed by some US allies (examples include Britain and Australia), perform both combat and conventional missions. However; like combat controllers, the conventional mission is limited.

APPENDIX B

JOINT TASK FORCE (JTF) KATRINA AIRSPACE CONTROL PLAN

HEADQUARTERS FIRST AIR FORCE
1 AF/CAOC
AIRSPACE CONTROL AUTHORITY
TYNDALL AFB, FLORIDA
4 SEPTEMBER 2005

JOINT TASK FORCE (JTF) KATRINA AIRSPACE CONTROL PLAN

SECTION 1 – General

1. **REFERENCES:**
a. Air Force Doctrine 2-1.7, *Airspace Control in the Combat Zone*
b. Federal Aviation Administration (FAA) Order 7610.4, *Special Military Operations*
c. Joint Publication 1-02, *DoD Dictionary of Military and Associated Terms*
d. Joint Publication 3-52, *Doctrine for Joint Airspace Control in the Combat Zone*
e. Joint Publication 3-56.1, *Command and Control for Joint Operations*
f. Multi-service Procedures, *Integrated Combat Airspace Command and Control (ICAC2)*

2. **PURPOSE:** This Airspace Control Plan (ACP) outlines airspace procedures for assessment, search, rescue, recovery and reconstitution operations in the FEMA-declared disaster areas along the gulf coast from Baton Rouge, LA east to Mobile, AL.

a. It may also be used for other military operations within the scope directed by the Combined Force Air Component Commander (CFACC). It is designed to incorporate the FAA air traffic capability in the region coupled with the rescue resources of the military into a cohesive unit. We have a tremendous responsibility and everyone is expected to maintain the utmost standards of professionalism during this operation.

b. This ACP is based on the premise that ATC facilities will continue to be used for as long as possible to provide VFR separation. Existing Air Traffic Control (ATC) facilities and communications will be used to the maximum extent possible. This document is in no way intended to supersede air traffic control procedures/instructions. Aircraft operating on routes inside Class B, C and D airspaces will operate in accordance with ATC airspace class requirements. This plan contains general guidance and procedures for airspace control within the KATRINA joint operations area.

3. **IMPLEMENTATION:** The guidance provided in this ACP is directive to all military recovery operations aircrew; air, ground or surface (land and naval) forces; air defense sector; and any current and future Command and Control agencies; and ground, naval, and DoD forces. Strict adherence to this ACP, as well as FAA air traffic procedures will

ensure the safe, efficient and expeditious use of airspace with minimum restrictions placed on civil or military aircraft. The key word being “Safe.”

a. Changes to this ACP will be disseminated via Special Instruction (SPINS) and/or separate messages, as required, and then incorporated in the next edition. The Airspace Control Order (ACO) implements this ACP.

b. This ACP is unclassified to ensure open and expeditious coordination and negotiation of ONE mission airspace information is exchanged between the CAOC and the FAA.

c. This ACP only covers aircraft participating in the recovery mission. It does not include civilian aircraft, routine military training flights, or military aircraft supporting other operations. It is strongly encouraged non-participating civilian aircraft adhere to the guidance in this plan and follow the TFRs and NOTAMS to the letter.

d. The ACP is effective upon order by the Airspace Control Authority (ACA). The Airspace Control Order (ACO) is effective 1000z-0959z daily and published along with the Air Tasking Order (ATO) and as a separate document. Retain the ACP and any changes throughout the operation.

4. **SAFETY:** This ACP is based on the understanding that FAA ATC facilities will continue to restore all facilities and return to normal operations. Until the FAA is fully operational and can provide radar traffic advisories in the area, a constant vigilance must be made to ensure the safest flight operations. In the meantime, a military Command and Control (C2) platform will be on station to assist in traffic calls but in no way replaces the ATC facility. It is merely to direct recovery operations. Military C2 platforms are not air traffic control agencies and should not provide vectors or altitude assignments without consent of the FAA ATC facility. This document supplements the capabilities of the FAA during degraded operations immediately following Katrina and will be operational as soon as possible.

a. Temporary Flight Restrictions are established by the FAA to ensure rescue operations can continue with minimal disruption to rescue and recovery operations; however, media helicopters operate in the same area and pose an additional flight risk.

b. Louis Armstrong New Orleans International Airport (KMSY) Class B airspace is conducting operations 24/7 using visual flight rules (VFR). Communications requirements for all classes of airspace must be obeyed at all times. Check NOTAMs for FAA operational airspace times.

c. Finally, safety of our aircrew is the number one priority. It can’t be stressed enough, when operating in any part of the disaster area; heads-up vigilance must be exercised. The opportunity for near-miss or mid-air is high and there are reports of small arms fire within the New Orleans TFR. If any small arms fire is observed, immediately

take protective measures and report the incident to the C2 aircraft/agency, FAA air traffic control and the CAOC. Geographic description is the SE corner of City Park, SSE through the French Quarter to the Mississippi River waterfront. Reported small arms fire coordinates: 295836N 0900635W, 295958N 0900425W, 295827N 0900258W, and 295707N 0900355W.

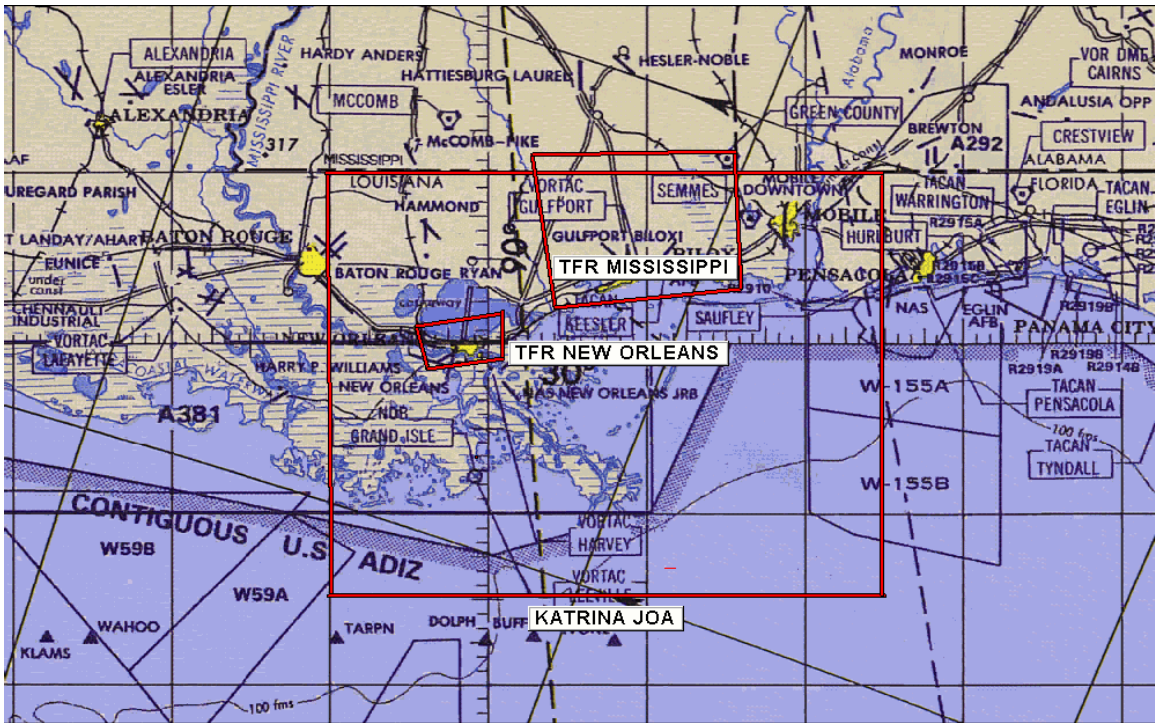

Figure 1. Katrina Joint Operating Area With Temporary Flight Restrictions

5. **KATRINA JOINT OPERATIONS AREA (JOA):** The JOA is the airspace encompassing southern Mississippi, southern Alabama and southern Louisiana, the areas hardest hit by the destructive path of Hurricane Katrina, surface up to but not including 5000' MSL. While there are currently TFRs established by the FAA that are mostly within the confines of the JOA, the JOA itself is not a TFR.

1. JOA
3100N 09100W
3100N 08730W
2830N 08730W
2830N 09100W

a. Search Grids. 125 15x15 NM search boxes are contained within the entire JOA, normally referred to as the Common Grid Reference System (CGRS). Each search box contains nine 5x5 NM (keypad) search areas.

6. OPERATIONS: Rescue operations within the JOA are conducted under VMC conditions. See and Avoid at all times. Visual Meteorological Conditions (VMC) will be used to the maximum extent possible. In the event of Instrument Meteorological Conditions (IMC), all aircrews will follow instructions from the ATC controlling agency or C2 monitoring agencies. All aircraft should use local altimeter.

7. MARITIME OPERATIONS: US Naval forces are in the process of positioning ships off the coast of Louisiana, Mississippi and Alabama to aid in the Humanitarian and Disaster Relief efforts. No naval airspace will be established over these forces. Numerous aircraft will conduct resupply, defensive support and ambulatory currier service to and from hospital ships.

8. CAPABILITIES

a. FAA. The Federal Aviation Administration (FAA) provides positive control to all air traffic operating within their designated control areas. The FAA is responsible for separation of aircraft by providing positive control of air traffic to ensure a safe, orderly and expeditious flow of air traffic within their assigned airspace. This is accomplished through the use of radar, non-radar and procedural methods. The FAA remains the controlling agency for all airspace within the United States and has delegated regional Air Route Traffic Control Centers (ARTCCs) to manage their respective areas. Terminal radar facilities may either be FAA or military controlled and designated in Letters of Agreements. Control towers direct activities in the immediate vicinities of active runways when so designated in an LOA.

b. 1st Air Force (1 AF). Located at Tyndall Air Force Base, Florida, 1 AF provides centralized command of all JTF Katrina military air-assets. As the senior military command and control agency in the US, 1 AF is responsible for centralized planning while the C2 platform is responsible for decentralized execution. Through partnership with the FAA and other government agencies, 1 AF maintains an open line of communication to ensure standard operating procedures are established and followed. 1 AF, subordinate to NORAD, interprets higher headquarters guidance and intent, determines priorities, creates a plan, and then monitors air-integration and synchronization of that plan. As the principle authority executing the NORAD Homeland Defense and Civil Support missions, 1 AF is divided into two main organizations, Combat Plans and Combat Operations. Combat Plans produces the Master Air Attack Plan (a military term for “schedule”) through the Air Tasking Order (ATO), Airspace Control Order (ACO), Special Instructions (SPINS), and Air Operations Directives (AOD). Combat Operations monitors the execution of the ATO, ACO and SPINS, and coordinates real-time changes to the schedule with the appropriate internal and external agencies. The term 1 AF and the Combined Air and Space Operations Center (CAOC) used in this document imply the same responsibilities.

c. Airspace Control Cell. 1 AF, Airspace managers are military and civilian air traffic controllers responsible for coordinating and integrating all JTF Katrina mission

airspace with the FAA. They utilize and incorporate the positive control elements of the National Airspace System (NAS) and procedural control capabilities of Theatre Battle Management Core Systems (TBMCS) computers. In recognition of the FAA's statutory responsibility, military air operations are designed to have as little impact on the NAS system as possible.

d. Command and Control (C2)/ Military Radar Units (MRUs): Integrated radar systems and communications capabilities are used to monitor all aircraft operating within the JOA. MRUs can be an airborne aircraft or a ground-based air defense sector.

SECTION 2 – Functional Responsibilities

The functional responsibilities are not overriding of any duties outlined in current procedures. They are designed to illustrate an expectation between organizations when coordination must occur. In a very broad sense, it demonstrates the interaction between the 1 AF Airspace Control Cell and each of the below components when coordinating JTF Katrina airspace.

1. AIRSPACE CONTROL CELL (ACC): Within 1 AF, the ACC is the CFACCs and the ACAs focal point for airspace coordination matters. Planning and coordination of airspace is conducted in the ACC.

a. The ACC will ensure airspace is coordinated with civil and military air traffic control facilities as well as the air defense sectors. Accurate and timely exchange of airspace requirements will ensure our intentions are well publicized. The ACC will ensure ATC plans are compatible with mission requirements and evaluate requests for airspace. The ACC will establish restrictions for the JOA and, after coordination with the respective mission planner, draft special procedures for the use of airspace, if necessary.

b. The risk of mid-air collision between aircraft has to be recognized. Airspace Coordinating Measure (ACM) requests supporting relief efforts will be processed on a first come, first served basis. Airspace managers will identify conflicts to airspace users for resolution. If the users are unable to resolve identified conflicts, higher authority (CFACC/ Sr FAA Officials) may direct deconfliction or accept the risk.

c. Total airspace deconfliction between military vs. military and military vs. civilian traffic would impose undue constraints on the National Airspace System. The ACO will govern usage of airspace within the JOA with a simple pre-planned system of ACMs that can be adjusted according to mission requirements. To assist with coordination, all component services and civil authorities, as required, will provide liaisons. All air activities will be thoroughly coordinated with FAA representatives.

d. The ACC is subdivided into two cells, one in Combat Plans and one in Combat Operations. The Combat Plans Airspace Control Cell's function is to deconflict preplanned ACM's for ATO's in planning and published in the ACO. The Combat

Operations Airspace Control Cell's primary function is to handle real-time airspace control issues during the ATO/ACO execution phase. Real time changes are accomplished through coordination with the sector FAA Air Defense Liaison Officers (ADLO). If a change needs to be made to an ACO in execution, Combat Plans Airspace Control Cell must make it.

2. **AIRSPACE CONTROL AUTHORITY (ACA):** See Combined Forces Air Component Commander.

3. **AIR DEFENSE SECTORS:** There are three air defense sectors responsible for maintaining watch over their respective areas within the United States and Puerto Rico. Each sector, NEADS/SEADS/WADS, is responsible for coordinating activities with military and civil authorities as outlined in the FAAH 7610.4. Among their many and varied responsibilities, they issue Airborne Orders (ABOs) and Scramble Orders in accordance with governing guidelines and coordinate with air traffic facilities on airspace activation.

4. **AIRCREW: Military** aircrews supporting JTF Katrina are responsible for reading, understanding and complying with the ATO and the ACO. In addition to the taskings set forth in these documents, aircrews are also responsible for filing flight plans, checking FAA Notice to Airman (NOTAMs), receiving a weather briefing, etc. In overseas combat theaters the ATO and the ACO are your "take off" directions. In the US, this is not the case. Aircrews must file standard flight plans through the FAA system, with a delay in the airspace assigned in the ATO. The ATO and ACO as well as the flight plan are the authorization.

5. **US COAST GUARD:** Coast Guard aircraft support the relief efforts. Their taskings, although a part of JTF Katrina, may not always be included in the ATO or the ACO.
6. **COMBINED FORCES AIR COMPONENT COMMANDER (CFACC):** The First Air Force Commander, located at Tyndall AFB, FL, is designated as the CFACC for JTF Katrina. Among many other duties, he also acts as the Airspace Control Authority (ACA) and the Air Defense Commander (ADC). The ACA establishes an airspace need that responds to the guidance provided by the Joint Force Commander (JFC). It provides for an integration of military operations in the NAS, and coordinates JTF Katrina airspace requirements. The ACA develops the Airspace Control Plan and, after JFC approval, promulgates it throughout the AO, to include civilian agencies. The ACA delegates airspace coordination responsibilities to the ACC.

7. **1 AF FAA ADLO:** The 1 AF FAA ADLO is the airspace coordination link between the Airspace Control Cell and FAA facilities. JTF Katrina airspace requirements are coordinated through the FAA ADLO to the affected air traffic control facilities to ensure mission accomplishment while limiting the impact to civilian aviation. Conflicts with civilian airspace are coordinated through the FAA ADLO.

8. **1 AF/CAOC PLANNERS:** Aircraft platforms that participate in JTF Katrina operations have planners located in the AOC. For tasking issues, contact 1 AF planners at 850-283-5840/5864/5841 or DSN 523-5840/5864/5841. For airspace planning issues 850-283-5860/5837 or DSN 523-5860/5837. For execution issues 850-283-5573/5480/5312 or DSN 523-5573/5480/5312.

9. **AIRSPACE CONTROL ORDER (ACO):** ACMs will be promulgated in the ACO and disseminated to all agencies concerned, military and civilian. The primary distribution method is via the Theater Battle Management Core Systems (TBMCS) or the next generation battle planning tools. The ACO and ATO are also posted on the NORAD home page, the 1 AF RELCAN website and the 1 AF SIPR website. These sites are unavailable outside military servers; however, this mission is unclassified and will be disseminated to civilian agencies.

a. The ACO will be published daily and will be effective until the next ACO is published. The ACO can be disseminated separately or as part of each basic ATO. If it is connected to the ATO it is located in the Special Instructions (SPINS) section. It is always available in the "AAT" module of TBMCS and on the websites listed in the previous paragraph.

b. The ACO will carry the same identification and time period as the ATO. Changes to the ACO will be disseminated in the same manner as the original but will be identified by their respective change number. All airspace users should review all changes to the ACO immediately, as it may directly impact their operation.

c. To ensure the FAA receives timely information on JTF Katrina activities, the ACC will pass along known airspace times shortly after the ACO is published.

10. **Air Tasking Order (ATO):** The ATO is published the same times as the ACO. It is designed to task aircraft to specific a mission and used in conjunction with the ACO.

SECTION 3 – Airspace Guidance

1. **SPIDER POINTS:** The below points are used by military helicopters to indicate route definition. The aircraft commander will list these names in the order flown.

AMPHIB 2859N 08759W
BURAS 2921N 08931W
CAT ISLAND 3013N 08909W
DAUPHIN 3019N 08808W
GONZALES 3015N 09055W
GRAND ISLAND 3008N 08925W
GULFPORT 3024N 08904W
HAMMONDS 2931N 09010W
HORN ISLAND 3014N 08841W

IRONTON 2939N 08957W
JACK EDWARDS 3017N 08740W
LEEVILLE 2910N 09006W
LUMBERTON 3100N 08925W
LUTCHER 3004N 09042W
MCHENRY 3042N 08908W
NAS NO 2949N 09001W
PICAYUNE 3031N 08939W
POPLARVILLE 3050N 08929W
PORT SULFUR 2928N 08941W
PROCTOR PT. 2957N 08943W
SALVADOR 2948N 09012W
SHELL 2902N 08919W
SHIP ISLAND 3012N 08858W
THREE BRIDGES 3009N 08951W
WIGGINS 3050N 08909W

2. **JOINT OPERATION AREA TRANSITIONING / INGRESS-EGRESS POINTS:** All military aircraft will enter and exit the JOA at one of these locations. Offset at least ½ mile to the right when entering or exiting the JOA. Maintain VFR at 1,000 MSL up to but not including 2,000 MSL. If originating within the JOA, proceed direct to your CGRS avoiding ATC airspace around airports. Civilian aircraft participating in JOA operations should use the same procedures as the military.

BASIL 3025N 08730W
BAY 3030N 08730W
CILANTRO 3100N 08730W
CINNAMON 3100N 09010W
CLOVES 3100N 08930W
CORIANDER 3100N 08810W
CUMIN 3100N 08850W
CURRY 3100N 09050W
HABANERA 3032N 09100W
HORSE RADISH 3034N 09100W
PARSLEY 2830N 08950W
PEPPER 2830N 08840W
SAGE 2830N 09100W
SALT 2830N 08730W

4. **JOA SEARCH AND RECOVERY PROCEDURES:** SAR operations will be conducted under VFR flight rules. While conducting active search and recovery operations maintain the altitude block surface up to but not including 500 MSL. Transitioning from search block to search block while on an active search and recovery mission will be in the block 500 MSL up to but not including 1,000 MSL.

5. **JOA FIXED WING / AIR REFUELING PROCEDURES:** Low altitude refueling operations are being conducted in the JOA. Altitudes of refueling operations should refuel at 2,500 MSL up to but not including 4,000 MSL. When not refueling, the C-130 should climb and maintain VFR between 4,000 up to but not including 5,000 MSL.

6. **JOA INGRESS/EGRESS PROCEDURES:** Aircraft entering the JOA must enter at one of the ingress points listed in paragraph 2 above and maintain 1,000 MSL up to but not including 2,000 MSL. Once in the confines of your grid, maintain VFR and descend to search and recovery altitudes. Search and recovery operations are surface up to but not including 500 MSL. If assigned to another grid that is not adjacent to the one your currently in, climb VFR to 500 MSL up to but not including 1,000 MSL until in the confines of your new grid, then descend to search altitudes.

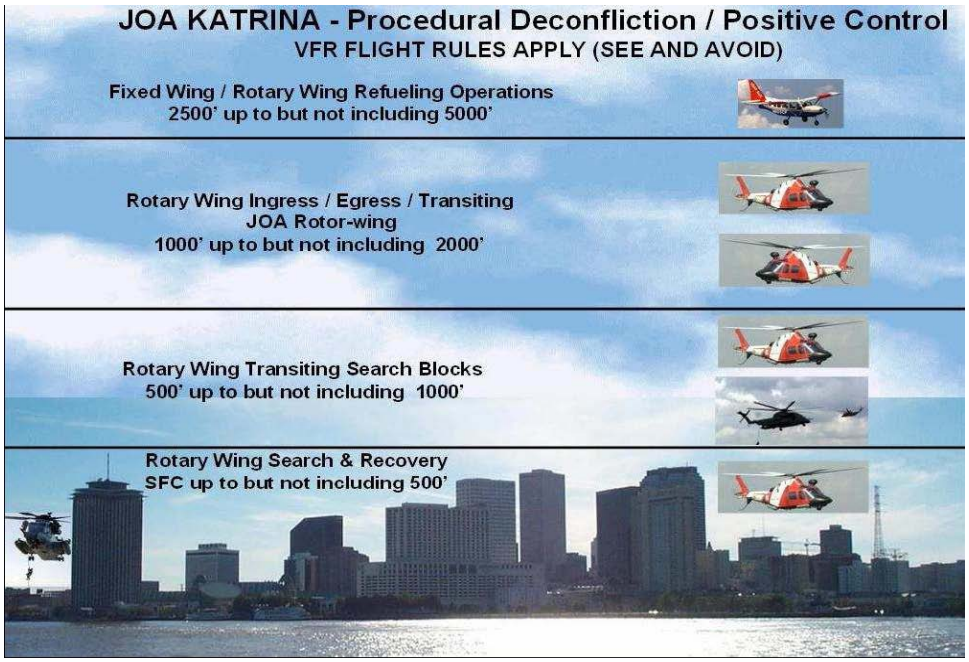

Figure 2. Search and Rescue Visual Flight Rules Operating Altitudes

NOTE: Glossary and approval signature omitted

BIBLIOGRAPHY

Adams, Marcella F. “Controlling the Bosnian Skies,” *Airman Magazine* (August 1996). Available from http://www.af.mil/news/airman/0896/caoc.htm. Internet. Accessed on 15 August 2006.

Air Land Sea Application Center. Field Manual 3-100.2; Marine Corps Reference Publication 3-25D; Navy Tactics, Techniques, and Procedures 3-52.1(A); and Air Force Tactics, Techniques, and Procedures (1) 3-2.16, *Multiservice Procedures for Integrated Combat Airspace Command and Control*. Washington, DC: GPO, 2000.

_____. Field Manual 3-52.3; Marine Corps Reference Publication 3-25A; Navy Tactics, Techniques, and Procedures 3-56.3; and Air Force Tactics, Techniques, and Procedures(1) 3-2.23, *Multiservice Procedures for Joint Air Traffic Control*. Marine Corps: PCN 1440000380, 2003

Beebe, Kevin A. Interviews by author, June-November 2006, Leavenworth, KS.

Bruckbauer, Brian R. *The Airspace Control System: A Key to Operational Maneuver*. Naval War College, 2004. Available from http://stinet.dtic.mil/cgi-bin/Get TRDoc?AD=ADA422799&Location=U2&doc=GetTRDoc.pdf. Internet. Last accessed on 30 November 2006.

Brown, Grover C. Interviews by author, June-November 2006, Leavenworth, KS.

Callander, Bruce D. “Controllers.” *Air Force Magazine* 86, no. 9 (2003): 1-4.

Chairman, Joint Chiefs of Staff. Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001, as amended through 8 August 2006. Available from http://www.dtic.mil/doctrine/jel/new_pubs/jp1_ 02.pdf. Internet. Accessed on 11 September 2006.

_____. Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone*. Washington, DC: GPO, 2004.

_____. Joint Publication 3-52, *Doctrine for Joint Airspace Control in the Combat Zone*. Washington, DC: GPO, 1995.

Chisholm, Chad. US Air Force Photo. *Air Force Link.* Available from http://www.af.mil/ photos/media_search.asp?q=controllers%20chisholm&page=5. Internet. Accessed on 20 September 2006.

Code of Federal Regulations, Title 14, Part 91. *Federal Aviation Regulations, Genera Operating and Flight Rules*. Available from http://ecfr.gpoaccess.gov/cgi/t/text/

text-idx?c=ecfr&sid=83b6025277e36d511c5e69 b2e8b4ef60&tpl=/ecfrbrowse/Title14/14cfr91_main_02.tpl. Internet. Last accessed on 30 November 2006.

Combined Forces Air Component Commander & Ministry of Transportation. *Afghanistan Aeronautical Information Manual*, 11th ed. February 2006. Available from http://ramcc.dtic.mil/afghan_AIP_20feb06.pdf. Internet. Accessed on 10 July 2006.

Department of the Air Force. Air Force Instruction 13-1 vol. 3, *Operational Procedures, Air and Space Operations Center*. Washington, DC: GPO, 2005.

_____. Air Force Instruction 13-1AD, *Air Defense Command and Control Operations* Vol. 3. Washington, DC: GPO, 2000.

_____. Air Force Instruction 13-201, *Airspace Management*. Washington, DC: GPO, 2001.

_____. Air Force Instruction 13-203, *Air Traffic Control*. Washington, DC: GPO, 2005

Department of the Army. Field Manual 1-120, *Army Air Traffic Services Contingency and Combat Zone Operations*. Washington, DC: GPO, 1995.

_____. Field Manual 3-52, *Army Airspace Command and Control in a Combat Zone*. Washington, DC: GPO, 2002.

Department of Navy. Marine Corps Warfighting Publication 3-25.7, *Tactical Air Operations Center Handbook*. Washington, DC: GPO, 1996.

EUROCONROL. *Harmonization of Operational Air Traffic and Its General Air Traffic Interface*. Brussels, Belgium: 2006. Available from http://www.eurocontrol.int/mil/public/standard_page/atm_mil_hogi.html. Internet. Last accessed on 24 November 2006.

Gravelle, Timothy G. Interviews by author, June-November 2006, Scott AFB, IL.

Grogan, Michael A. *Airspace Control Authority in Stability Operations: The Role of the United States Air Force in Rebuilding Afghanistan's National Airspace System* (M-P 43122 G874a). Maxwell AFB, AL: Air University Press, 2005.

Headquarters, Air Force Doctrine Center. Air Force Doctrine Document 2-1.7, *Airspace Control in the Combat Zone*. Maxwell AFB, AL: Air University Press, 2001.

Headquarters, First Air Force. Airspace Control Authority, *Joint Task Force Katrina Airspace Control Plan*. Tyndall Air Force Base, FL: GPO, 2005.

Huntington, Bill. US Air Force Photo. *Air Force Link*, 2005. Available from http://www.af.mil/photos/media_search.asp?q=katrian+Huntington&btnG.x=5&btnG.y=14. Internet. Accessed on 5 December 2006.

International Civil Aviation Organization. *Making an ICAO Standard, Forms of Recommended Standards and Practices*. Montreal, Canada: 2004. Available from http://www.icao.int/cgi/goto_m.pl?/icao/en/anb/mais/index.html. Internet. Last accessed on 30 November 2006.

Iraq Civil Aviation Authority. *Republic of Iraq Aeronautical Information Manual*, 17th ed. 2006. Available from http://ramcc.dtic.mil/forms/ iraq_aip_edition_17.pdf. Internet. Accessed on 10 July 2006.

Krogh, Jimmy C. Interviews by author, June-November 2006, Scott AFB, IL.

Quinlin, Jon. "Tyndall Spearheads F-22 Fighter Tactics Integration." *Air Force Print News Today*. Available from http://www.af.mil/news/story.asp?stroyID= 123024639. Internet. Accessed on 25 November 2006.

Militello, Anthony L. Electronic correspondence with author, 8 November 2006, Leavenworth, KS.

North Atlantic Treaty Organization. Allied Joint Publication 3.3, *Joint Air and Space Operations Doctrine* (Change 1). Restricted Release. Brussels, Belgium: 2002.

_____. Allied Joint Publication 3.3.5(A), *Doctrine for Joint Airspace Control*. Restricted Release. Brussels, Belgium: 2002.

Tigue, John. Interviews by author, June-November 2006, Leavenworth, KS.

Tompkins, Kevin C. Interview by author, 24 August 2006, Fort Leavenworth, KS.

Turner, Jeremey T. Interviews by author, June-November 2006, Leavenworth, KS.

US Department of Transportation. Federal Aviation Administration Order 7610.4K, *Special Military Operations*. Washington, DC: GPO, 2004.

_____. DOT 122-05 News Release, *DOT Activities in Support of Federal Response to Hurricane Katrina*. Washington, DC: 2005. Available from http://www.dot.gov/ affairs/dot12205.htm. Internet. Last accessed on 22 November 2006.

Wathan, Alexander M. "The Miracle of Operation Iraqi Freedom Airspace Management." *Air and Space Power Journal* (2005). Available from http://www.airpower.maxwell.af.mil/airchronicles/cc/wathen.html. Internet. Last accessed on 25 November 2006.

White House. *The Federal Response to Hurricane Katrina, Lessons Learned*. Washington, DC: GPO, 2006.

INITIAL DISTRIBUTION LIST

Combined Arms Research Library
U.S. Army Command and General Staff College
250 Gibbon Ave.
Fort Leavenworth, KS 66027-2314

Defense Technical Information Center/OCA
825 John J. Kingman Rd., Suite 944
Fort Belvoir, VA 22060-6218

LTC John C. Reynolds Jr.
CTAC
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352

Dr. Deborah C. Kidwell
DMH
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352

Col William A. Malec
HQ AMC/A3A
402 Scott Drive, Unit 3A1
Scott AFB, IL 62225

CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT

1. Certification Date: 15 December 2006

2. Thesis Author: Major John B. Esch

3. Thesis Title: Integrating Coexistent Combat and Conventional Airspace within Contingency Areas

4. Thesis Committee Members: _____

Signatures: _____

_____

5. Distribution Statement: See distribution statements A-X on reverse, then circle appropriate distribution statement letter code below:

(A) B C D E F X SEE EXPLANATION OF CODES ON REVERSE

If your thesis does not fit into any of the above categories or is classified, you must coordinate with the classified section at CARL.

6. Justification: Justification is required for any distribution other than described in Distribution Statement A. All or part of a thesis may justify distribution limitation. See limitation justification statements 1-10 on reverse, then list, below, the statement(s) that applies (apply) to your thesis and corresponding chapters/sections and pages. Follow sample format shown below:

EXAMPLE

Limitation Justification Statement	/	Chapter/Section	/	Page(s)
Direct Military Support (10)	/	Chapter 3	/	12
Critical Technology (3)	/	Section 4	/	31
Administrative Operational Use (7)	/	Chapter 2	/	13-32

Fill in limitation justification for your thesis below:

Limitation Justification Statement	/	Chapter/Section	/	Page(s)
	/		/	
	/		/	
	/		/	
	/		/	
	/		/	

7. MMAS Thesis Author's Signature: _____

STATEMENT A: Approved for public release; distribution is unlimited. (Documents with this statement may be made available or sold to the general public and foreign nationals).

STATEMENT B: Distribution authorized to U.S. Government agencies only (insert reason and date ON REVERSE OF THIS FORM). Currently used reasons for imposing this statement include the following:

1. Foreign Government Information. Protection of foreign information.

2. Proprietary Information. Protection of proprietary information not owned by the U.S. Government.

3. Critical Technology. Protection and control of critical technology including technical data with potential military application.

4. Test and Evaluation. Protection of test and evaluation of commercial production or military hardware.

5. Contractor Performance Evaluation. Protection of information involving contractor performance evaluation.

6. Premature Dissemination. Protection of information involving systems or hardware from premature dissemination.

7. Administrative/Operational Use. Protection of information restricted to official use or for administrative or operational purposes.

8. Software Documentation. Protection of software documentation - release only in accordance with the provisions of DoD Instruction 7930.2.

9. Specific Authority. Protection of information required by a specific authority.

10. Direct Military Support. To protect export-controlled technical data of such military significance that release for purposes other than direct support of DoD-approved activities may jeopardize a U.S. military advantage.

STATEMENT C: Distribution authorized to U.S. Government agencies and their contractors: (REASON AND DATE). Currently most used reasons are 1, 3, 7, 8, and 9 above.

STATEMENT D: Distribution authorized to DoD and U.S. DoD contractors only; (REASON AND DATE). Currently most reasons are 1, 3, 7, 8, and 9 above.

STATEMENT E: Distribution authorized to DoD only; (REASON AND DATE). Currently most used reasons are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

STATEMENT F: Further dissemination only as directed by (controlling DoD office and date), or higher DoD authority. Used when the DoD originator determines that information is subject to special dissemination limitation specified by paragraph 4-505, DoD 5200.1-R.

STATEMENT X: Distribution authorized to U.S. Government agencies and private individuals of enterprises eligible to obtain export-controlled technical data in accordance with DoD Directive 5230.25; (date). Controlling DoD office is (insert).